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Program bova - listing, March 1975.

W. S. Peterson

C. N. Kostem

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16. Abstract

The report contains the listing of Program BOVA (Bridge OVerload Analysis). The program is written in FORTRAN IV and was tested in the Control Data Corporation 6400 Computer. The program is capable of predicting the full history of stresses, strains, deformations and damages that may occur to simple span beam-slab bridge superstructures with reinforced or prestressed concrete I-beams when they are subjected to overload vehicles. The analysis scheme employs the finite element displacement method and permits the inclusion of material nonlinearities. The pertinent theoretical developments, comparisons, and the information for the use of the program have been presented in other reports.

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Project 71-12: Overloading Behavior of Beam-Slab Type Highway Bridges

PROGRAM BOVA-LISTING

(Bridge Overloading Analysis)

by

William S. Peterson
Celal N. Kostem

This work was sponsored by the Pennsylvania Department of Transportation and the U. S. Department of Transportation, Federal Highway Administration.

LEHIGH UNIVERSITY

Office of Research

Bethlehem, Pennsylvania

March 1975

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ABSTRACT

The report contains the listing of Program BOVA (Bridge OVerload Analysis). The program is written in FORTRAN IV and was tested in the Control Data Corporation 6400 Computer. The program is capable of predicting the full history of stresses, strains, deformations and damages that may occur to simple span beam-slab bridge superstructures with reinforced or prestressed concrete I-beams when they are subjected to overload vehicles. The analysis scheme employs the finite element displacement method and permits the inclusion of material nonlinearities. The pertinent theoretical developments, comparisons, and the information for the use of the program have been presented in other reports.

1. Introduction

This report contains the listing of Program BOVA (Bridge OVerload Analysis). The program was developed within the framework of the research project The Overloading Behavior of Beam-Slab Type Highway Bridges. The program is capable of predicting the elastic and inelastic response of simple span beam-slab type highway bridge superstructures with reinforced concrete deck and reinforced or prestressed concrete rectangular, T- or I-beams. The inelastic response of the bridge superstructure is assumed to occur due to the traverse of the overload vehicles.

2. Scope of the Investigation

The modeling of the bridge superstructure and the analysis of the developed analytical model are accomplished through the use of the finite element displacement method. The analysis is based on the first order geometry, i.e. the equations of equilibrium and compatibility are formulated on undeformed geometry. All material nonlinearities for concrete, reinforcing steel and the prestressing strands have been included in the formulation. The loading is assumed to be static in nature, and due to the nonlinearity of the overall problem, an incremental loading scheme is used. That is, if the total load of the overload vehicle is "P" small increments of "P" are applied and the structure is analyzed, then another fraction of "P" is applied, etc. until the attainment of the desired load level or the failure of the bridge superstructure. The superstructure failure is defined through the monitoring of certain

response characteristics, such as the strain, stress, crack width, etc.

3. Analytical Modeling of the Superstructure

The analytical modeling of the bridge superstructure is undertaken by discretizing the system to plate bending finite elements and beam elements. Their aggregation corresponds to the actual superstructure. In order to account for the penetration of the material nonlinearities as well as the damage, these elements are further divided into layers through the depth of the beams and the slab. This subdivision technique permits the assessment of the damage, and also the penetration of the damage for various locations in the superstructure for various load levels. The program provides the stresses in the superstructure at various locations, according to the finite element discretization employed, as tabulated printouts and as printer generated plots which can be used by engineers for quick assessment of the damage to the bridge for a given load level and loading location.

In the development of the overall modeling and analysis scheme, the research was compartmentalized and different phases were reported in different reports.

Report 1: The development of the finite element analysis scheme for eccentrically stiffened plates, i.e. bridges where the superstructure is assumed to remain elastic. ("Finite Element Analysis of Plates and Eccentrically Stiffened Plates," by A. W. Wegmuller and C. N. Kostem, Fritz Engineering Laboratory Report No. 378A.3, Lehigh

University, February 1973.)

Report 2: The development of the basic model and solution scheme for the eccentrically stiffened plates, i.e. bridge superstructure, including material nonlinearities following the perfect plasticity relations. ("Finite Element Analysis of Elastic-Plastic Plates and Eccentrically Stiffened Plates," by A. W. Wegmuller and C. N. Kostem, Fritz Engineering Laboratory Report No. 378A.4, Lehigh University, February 1973.)

Report 3: The modeling of reinforced and prestressed concrete beams, and the developments of analytical expressions for the inelastic response of concrete and steel subjected to uniaxial stress field. ("The Inelastic Analysis of Reinforced and Prestressed Concrete Beams," by J. M. Kulicki and C. N. Kostem, Fritz Engineering Laboratory Report No. 378B.1, Lehigh University, November 1972.)

Report 4: The finalization of the computer program used to predict the inelastic response of bridge beams. ("User's Manual for Program Beam," by J. M. Kulicki and C. N. Kostem, Fritz Engineering Laboratory Report No. 378B.2, Lehigh University, February 1973.)

Report 5: Pilot studies on the inelastic response of bridges, assuming that the beams will have the actual inelastic

response as reported in the above reports (Repts. 3 and 4) and the deck slab will exhibit perfect plasticity. ("The Inelastic Analysis of Prestressed and Reinforced Concrete Bridge Beams by the Finite Element Method," by J. M. Kulicki and C. N. Kostem, Fritz Engineering Laboratory Report No. 378A.6, Lehigh University, September 1973.)

Report 6: Inelastic analysis of reinforced concrete deck slabs, exhibiting all forms of material nonlinearities. ("The Inelastic Analysis of Reinforced Concrete Slabs," by W. S. Peterson, C. N. Kostem and J. M. Kulicki, Fritz Engineering Laboratory Report No. 378B.3, Lehigh University, May 1974.)

Report 7: Inelastic analysis of beam-slab bridge superstructures interfacing the analysis techniques developed and reported in Report 3 and Report 6 to predict the overload response of the bridges. ("The Inelastic Analysis of Beam-Slab Highway Bridge Superstructures," by W. S. Peterson and C. N. Kostem, Fritz Engineering Laboratory Report No. 378B.5, Lehigh University, March 1975.)

Report 8: The sensitivity of the analytical scheme presented in Report 7 is demonstrated through case studies. The report also contains summaries of Reports 6 and 7. ("The Inelastic Analysis of Beam-Slab Bridges," by W. S. Peterson and C. N. Kostem, Fritz Engineering Laboratory Report No. 400.20, Lehigh University, July 1975.)

Report 9: The formulations (Reports 1 through 8) employed in the prediction of the inelastic behavior of beam, slab and bridge superstructure are essentially based on the flexural response of these components. The pilot studies indicated that the stresses perpendicular to the plane of the slab do not cause any deviations in the prediction of the overload response via Program BOVA. ("Shear Punching of Bridge Decks," by C. N. Kostem, Fritz Engineering Laboratory Report No. 378B.4, Lehigh University, January 1977.)

Report 10: Application of Program BOVA to a wide range of bridge configurations resulted in a parametric study. ("Overloading of Highway Bridges - A Parametric Study," by C. N. Kostem, Fritz Engineering Laboratory Report No. 378B.7, Lehigh University, August 1976.)

Report 11: Description of the input and the output of the computer program to be employed, whose application was presented in Report 7, to predict the overload response of beam-slab type highway bridges. ("User's Manual for Program BOVA," by W. S. Peterson and C. N. Kostem, Fritz Engineering Laboratory Report No. 378B.6A, Lehigh University, March 1975.)

It should be noted that Reports 1, 2, 3 and 6 contain the fundamental research leading to the development of the analysis scheme for the overloading of the components of bridge superstructures. Reports 3, 5, 6, 7, and 8 contain the essential formulation and pertinent numerical

comparisons for the formulation of the prediction of the overloading of the types of bridges in question. Reports 7, 8 and 10 contain detailed applications of Program BOVA to bridge superstructures.

Prior to making major changes in Program BOVA it is essential that the implications of these changes be recognized through the mastery of Reports 3, 6 , 7 and 11. Minor changes in Program BOVA, which will not effect the overall analysis scheme, should be undertaken with appropriate modifications, if needed, in Report 11.

Reports 3, 4, 6, 7, 9, 10 and 11 were prepared as a partial fulfillment of the requirements of Pennsylvania Department of Transportation's Research Project 71-12, Overloading Behavior of Beam-Slab Type Highway Bridges. The distribution copies of these reports have been submitted to the Pennsylvania Department of Transportation.

4. Computer Environment

The program listed in this report was developed at Lehigh University's Computing Center using Control Data Corporation's 6400 digital computer. Every effort was made to comply with standard FORTRAN IV; however, due to the complexity of the analysis scheme and consequently that of the computer program, certain "commands and functions" were used that are peculiar to CDC 6400 computers. The implementation of this program at other installations will require changing some of the statements that are machine dependent and substituting them with those that the other computer configurations will have.

It should also be noted that the listed program has been extensively tested and appears to be totally debugged, but perfection is an elusive goal in computer program development so it is possible that some bugs may have gone undetected.

5. Implementation

The program presented herein can be used to predict the overload response of beam-slab bridges. The use of the program has been described in detail in Report 11 referred to in Section 3. The program can be used not only for the overload analysis of the bridges, if the load levels in question are in excess of the design load levels, but if the bridge has deteriorated it can also be used to find the loading which will not induce any damage. That is, the program can be used for the rating of bridges as well. In the use of the program it is strongly advisable that the "User's Manual for Program BOVA" always be referred to in order to have correct input and not to make systematic errors in the input or in the interpretation of the output.

The changes that may be made to this program should be undertaken with great care. It's complexity may be undetected by the "average programmer," thus intended improvements may in turn destroy the integrity of the program and may result in incorrect answers.

6. Listing of Program BOVA

(Bridge OVerload Analysis)

```
      OVERLAY  (ECCP,0,0)                                                    BOVA    2
      PROGRAM BOVA(TAPE3=100,TAPE6=100,TAPE11=100,TAPE13=100,TAPE14=100,BOVA    3
     1TAPE12=100,TAPE27=0,TAPE16=100,TAPE17=100,TAPE18=100,TAPE20=100,TABOVA    4
     2PE22=100,TAPE24=100,TAPE25=100,TAPE28=100,TAPE29=100,TAPE30=100,TABOVA    5
     3PE31=100,TAPE33=100,INPUT=100,TAPE1=INPUT,OUTPUT=100,TAPE2=OUTPUT,BOVA    6
     4STARTC=100,TAPE7=STARTC,PLOTC=100,TAPE8=PLOTC,START1=100,TAPE9=STABOVA    7
     5RT1,JUM4=100,TAPE4=JUM4,JUM5=100,TAPE5=JUM5,J19=100,TAPE19=J19,J23BOVA    8
     6=100,TAPE23=J23,J15=100,TAPE15=J15,J21=100,TAPE21=J21,J32=100,TAPEBOVA    9
     732=J32)                                                               BOVA   10
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C                                                                           BOVA   18
C              BY                                                           BOVA   19
C     CELAL N. KOSTEM                                                       BOVA   20
C     WILLIAM S. PETERSON                                                   BOVA   21
C                                                                           BOVA   22
C     FRITZ ENGINEERING LABORATORY                                          BOVA   23
C     LEHIGH UNIVERSITY                                                     BOVA   24
C     BETHLEHEM, PENNSYLVANIA                                               BOVA   25
C                                                                           BOVA   26
C                                                                           BOVA   27
C     COMPILER      - FORTRAN 3.0, LEVEL G                                  BOVA   28
C     CONFIGURATION- CDC 6400                                               BOVA   29
C                    LEHIGH UNIVERSITY, BETHLEHEM, PA.                      BOVA   30
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C        -THE INELASTIC ANALYSIS OF REINFORCED CONCRETE SLABS-              BOVA   39
C              FRITZ ENGINEERING LABORATORY REPORT NO.378B.3                BOVA   40
C              BY W. S. PETERSON, C. N. KOSTEM, AND J. M. KULICKI           BOVA   41
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C              NPI(NEQ2), NPJ(NEQ2), NPL(NEQ2), NPI(NEQ3), NPJ(NEQ3),          BOVA  77
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C     TAPE 13- NPARX, NXL, NXR, NPIX, NPKX  -STIFFNESS MATRIX                  BOVA  81
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C     TAPE 19- SIGXXO,SIGYYO,SIGXYO                                            BOVA  88
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C     TAPE 22- SXXOT,SYYOT,SXYOT -STIFFNESS MATRIX                             BOVA  91
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      COMMON /CB3/ LWIDTH,NITA,NPSEGM                                          BOVA 107
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      COMMON /PROPC/ V(11)                                                     BOVA 110
      COMMON /ITAPE/ ITN,ITO,I12,I22,I32                                       BOVA 111
      COMMON /PROPCB/ ZA,EZA,ZB,EZB                                            BOVA 112
      COMMON /EDOWN/ DUMMY5(2)                                                 BOVA 113
      COMMON /SIGNIF/ NSIGNI(2)                                                BOVA 114
      COMMON /TFAIL/ TOLF                                                      BOVA 115
      COMMON /TUOO/ TUO(8,12)                                                  BOVA 116
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      COMMON /PFACT/ PFC                                                BOVA 118
      COMMON /PLTCD/ PLTCRD                                             BOVA 119
      COMMON /COMPLT/ ICMPLT                                            BOVA 120
      COMMON /SCALED/ ISCALE,IFN                                        BOVA 121
      COMMON /DEADL/ IDEAD,ITERD,NITERD,ITRALD                          BOVA 122
      COMMON /SEARCH/ ISRCH,ISRT                                        BOVA 123
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      INTEGER G                                                         BOVA 156
      DIMENSION NPROB(16)                                               BOVA 157
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      IN=1                                                              BOVA 164
      IO=2                                                              BOVA 165
C                                                                       BOVA 166
C     PRINT THE BANNER PAGE                                             BOVA 167
C                                                                       BOVA 168
      WRITE(IO,100)                                                     BOVA 169
      WRITE(IO,101)                                                     BOVA 170
      WRITE(IO,102)                                                     BOVA 171
  100 FORMAT(1H1,/////,                                                 BOVA 172
     140X,52H* * * * * * * * * * * * * * * * * * * * * * * * * * * * *  ,/,  BOVA 173
     240X,52H*                                                       *  ,/,  BOVA 174
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     440X,52H*                                                    *  ,/,    BOVA 176
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     640X,52H*                                                    *  ,/,    BOVA 178
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     840X,52H*                                                    *  ,/,    BOVA 180
     940X,52H*                                                    *  )      BOVA 181
 101 FORMAT(                                                                 BOVA 182
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     240X,52H*                 TO PREDICT THE OVERLOAD RESPONSE  *  ,/,    BOVA 185
     340X,52H*                            OF                     *  ,/,    BOVA 186
     440X,52H*                   SIMPLE SPAN BEAM-SLAB BRIDGES    *  ,/,    BOVA 187
     540X,52H*                     WITH P/S OR R.C. I-BEAMS       *  ,/,    BOVA 188
     640X,52H*                        AND R.C. DECK SLAB          *  ,/,    BOVA 189
     740X,52H*                                                    *  ,/,    BOVA 190
     840X,52H*                                                    *  ,/,    BOVA 191
     940X,52H*                            BY                      *  )      BOVA 192
 102 FORMAT(                                                                 BOVA 193
    $40X,52H*                       CELAL  N.  KOSTEM            *  ,/,    BOVA 194
     140X,52H*                    WILLIAM  S.  PETERSON           *  ,/,    BOVA 195
     240X,52H*                                                    *  ,/,    BOVA 196
     340X,52H*                 FRITZ ENGINEERING LABORATORY       *  ,/,    BOVA 197
     440X,52H*                      LEHIGH UNIVERSITY             *  ,/,    BOVA 198
     540X,52H*                  BETHLEHEM, PENNSYLVANIA           *  ,/,    BOVA 199
     640X,52H*                            1975                    *  ,/,    BOVA 200
     740X,52H*                                                    *  ,/,    BOVA 201
     840X,52H*                                                    *  ,/,    BOVA 202
     940X,52H* * * * * * * * * * * * * * * * * * * * * * * * * * *  )      BOVA 203
      CALL REQMEM(700008)                                                    BOVA 204
C                                                                           BOVA 205
C     INITIALIZE CORE REQUIREMENT CODE                                      BOVA 206
C                                                                           BOVA 207
      DO 110 I=1,10                                                         BOVA 208
      ICORE(I)=0                                                            BOVA 209
  110 CONTINUE                                                              BOVA 210
C                                                                           BOVA 211
C     READ THE PROBLEM ID                                                   BOVA 212
C                                                                           BOVA 213
      READ (IN,120) NPROB                                                   BOVA 214
  120 FORMAT (16A5)                                                         BOVA 215
      WRITE (IO,130) NPROB                                                  BOVA 216
  130 FORMAT (1H1,////,6X,20(1H-),16A5,20(1H-))                             BOVA 217
C                                                                           BOVA 218
      READ (IN,220) NELX,NELY                                               BOVA 219
      READ (IN,220) NULAY,NSLAYR                                            BOVA 220
      READ (IN,220) NCBM                                                    BOVA 221
C                                                                           BOVA 222
C     CHECK FOR PREDISCRETIZATION                                           BOVA 223
C                                                                           BOVA 224
      PRED=3H NO                                                            BOVA 225
      IF (NELX.LT.0) PRED=3HYES                                             BOVA 226
      IF (PRED.NE.3HYES) GO TO 150                                          BOVA 227
C                                                                           BOVA 228
      WRITE (IO,140) PRED,NELX,NELY                                         BOVA 229
  140 FORMAT (1H0,//,6X,*PREDISCRETIZATION OPTION WILL BE USED=  *,A3,//BOVA 230
     1,9X,*LONGITUDINAL MESH GENERATION CODE = *,I4,//,9X,*TRANSVERSE MEBOVA 231
     2SH GENERATION CODE    = *,I4)                                       BOVA 232
C                                                                           BOVA 233
```

```
C      DEFINE NELX AND NELY                                                  BOVA 234
C                                                                            BOVA 235
       IDX=NELX                                                              BOVA 236
       IDY=NELY                                                              BOVA 237
       NELX=0                                                                BOVA 238
       NELY=0                                                                BOVA 239
C                                                                            BOVA 240
       IF (IDX.EQ.-1) NELX=8                                                 BOVA 241
       IF (IDX.EQ.-2) NELX=8                                                 BOVA 242
       IF (IDX.EQ.-3) NELX=6                                                 BOVA 243
C                                                                            BOVA 244
       IF (IDY.LT.0) NELY=-(NOBM-1)*IDY                                      BOVA 245
       IF (IDY.GT.0) NELY=(NOBM-1)*IDY+IDY                                   BOVA 246
       IF (IDY.EQ.-100) NELY=6                                               BOVA 247
       IF (IDY.EQ.-200) NELY=8                                               BOVA 248
C                                                                            BOVA 249
  150 CONTINUE                                                               BOVA 250
       WRITE (IO,160) NELX,NELY                                              BOVA 251
  160 FORMAT (//,5X,*NUMBER OF SLAB ELEMENTS ALONG THE X-AXIS      =*,I8,BOVA 252
     1//,5X,*NUMBER OF SLAB ELEMENTS ALONG THE Y-AXIS      =*,I8,1X)       BOVA 253
C                                                                            BOVA 254
       WRITE (IO,170) NULAY,NSLAYR                                           BOVA 255
  170 FORMAT (//,5X,*NUMBER OF CONCRETE LAYERS IN SLAB, NULAY      =*,I8,BOVA 256
     1//,5X,*NUMBER OF STEEL LAYERS IN SLAB, NSLAYR       =*,I8,1X)       BOVA 257
C                                                                            BOVA 258
       NBEAMX=NOBM*NELX                                                      BOVA 259
       WRITE (IO,180) NOBM,NBEAMX                                            BOVA 260
  180 FORMAT (//,5X,*NUMBER OF BEAMS                          =*,I8,BOVA 261
     1//,5X,*TOTAL NUMBER OF BEAM ELEMENTS, NBEAMX        =*,I8,1X)       BOVA 262
C                                                                            BOVA 263
       IF (NOBM.GT.20) WRITE (IO,190)                                        BOVA 264
  190 FORMAT (1H0,//,6X,*MAXIMUM NUMBER OF BEAMS HAVE BEEN EXCEEDED*,//)BOVA 265
       IF (NOBM.GT.20) STOP 0                                                BOVA 266
C                                                                            BOVA 267
       READ (IN,220) NULAYR,NULAYE,NPS                                       BOVA 268
       NULAY8=NULAYR+NULAYE+NPS                                              BOVA 269
       NRE=NULAYR+NULAYE                                                     BOVA 270
       WRITE (IO,200) NULAYR,NULAYE,NPS                                      BOVA 271
  200 FORMAT (//,5X,*NUMBER OF ACTUAL LAYERS FOR BEAM              =*,I8,BOVA 272
     1//,5X,*NUMBER OF EMBEDDED LAYERS IN BEAM          =*,I8,//,5X,*NBOVA 273
     2UMBER OF PRESTRESS STRAND GROUPS          =*,I8,1X)                 BOVA 274
C                                                                            BOVA 275
       READ (IN,220) NR,NRS                                                  BOVA 276
       WRITE (IO,210) NR,NRS                                                 BOVA 277
  210 FORMAT (//,5X,*MAX NUMBER OF BEAM PROPERTY SECTIONS          =*,I8,BOVA 278
     1//,5X,*MAX NUMBER OF POINTS FOR PRESTRESS PROFILE   =*,I8,1X)      BOVA 279
C                                                                            BOVA 280
C      FIND MAXIMUM FOR DIMENSIONING ARRAYS                                  BOVA 281
C                                                                            BOVA 282
       IF (NRS.GT.NR) NR=NRS                                                 BOVA 283
C                                                                            BOVA 284
       READ (IN,220) NPSEGM                                                  BOVA 285
  220 FORMAT (10I5)                                                          BOVA 286
       IF (NPSEGM.EQ.0) NPSEGM=1                                             BOVA 287
       WRITE (IO,230) NPSEGM                                                 BOVA 288
  230 FORMAT (//,5X,*NUMBER OF SEGMENTS                        =*,I8)BOVA 289
       NPSEGM=(NELX+1)*(NELY+1)/NPSEGM                                       BOVA 290
C                                                                            BOVA 291
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      IF (NULAY.GT.15) WRITE (IO,240)                                   BOVA 292
  240 FORMAT (1H0,//,6X,*MAXIMUM NUMBER OF SLAB CONCRETE LAYERS HAS BEENBOVA 293
     1 EXCEEDED*,//)                                                    BOVA 294
      IF (NULAY.GT.15) STOP 0                                           BOVA 295
      IF (NSLAYR.GT.6) WRITE (IO,250)                                   BOVA 296
  250 FORMAT (1H0,//,6X,*MAXIMUM NUMBER OF SLAB STEEL LAYERS HAS BEEN EXBOVA 297
     1CEEDED*,//)                                                       BOVA 298
      IF (NSLAYR.GT.6) STOP 0                                           BOVA 299
C                                                                       BOVA 300
C*********************************************************************  BOVA 301
C     DATA INPUT AND INITIAL SOLUTION PROCEDURES                        BOVA 302
C*********************************************************************  BOVA 303
C                                                                       BOVA 304
C                                                                       BOVA 305
C     SET UP COMMON BLOCKS OVER1, ETC WHICH CONTAIN ARRAY LOCATIONS     BOVA 306
C                                                                       BOVA 307
      CALL OVERLAY (4LECCP,9,0)                                         BOVA 308
C                                                                       BOVA 309
C     FIND CORE REQUIERMENTS                                            BOVA 310
C                                                                       BOVA 311
      CALL OVERLAY (4LECCP,1,0)                                         BOVA 312
      CALL OVERLAY (4LECCP,2,0)                                         BOVA 313
      CALL OVERLAY (4LECCP,3,0)                                         BOVA 314
      CALL OVERLAY (4LECCP,4,0)                                         BOVA 315
      CALL OVERLAY (4LECCP,5,0)                                         BOVA 316
      I12=NCNS                                                          BOVA 317
      I22=NCNS                                                          BOVA 318
      I32=NCNS                                                          BOVA 319
      CALL OVERLAY (4LECCP,6,0)                                         BOVA 320
      CALL OVERLAY (4LECCP,7,0)                                         BOVA 321
      CALL OVERLAY (4LECCP,8,0)                                         BOVA 322
      CALL OVERLAY (4LECCP,10,0)                                        BOVA 323
C                                                                       BOVA 324
      NRFL=ICORE(1)+A(17)                                               BOVA 325
      I=1                                                               BOVA 326
      WRITE (IO,260) I,ICORE(I),NRFL                                    BOVA 327
  260 FORMAT (1H ,//,5X,*OVERLAY *,I2,*        CM NEEDED TO LOAD OVERLAYBOVA 328
     1  = *,O8,/,23X,*CM WITH DATA ARRAY STORAGE = *,O8)                BOVA 329
      ICORE(I)=NRFL                                                     BOVA 330
C                                                                       BOVA 331
      NRFL=ICORE(2)+B(22)                                               BOVA 332
      I=2                                                               BOVA 333
      WRITE (IO,260) I,ICORE(I),NRFL                                    BOVA 334
      ICORE(I)=NRFL                                                     BOVA 335
C                                                                       BOVA 336
      NRFL=ICORE(3)+C(11)                                               BOVA 337
      I=3                                                               BOVA 338
      WRITE (IO,260) I,ICORE(I),NRFL                                    BOVA 339
      ICORE(I)=NRFL                                                     BOVA 340
C                                                                       BOVA 341
      NRFL=ICORE(4)+D(27)                                               BOVA 342
      I=4                                                               BOVA 343
      WRITE (IO,260) I,ICORE(I),NRFL                                    BOVA 344
      ICORE(I)=NRFL                                                     BOVA 345
C                                                                       BOVA 346
      NRFL=ICORE(5)+E(53)                                               BOVA 347
      I=5                                                               BOVA 348
      WRITE (IO,260) I,ICORE(I),NRFL                                    BOVA 349
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      ICORE(I)=NRFL                                                    BOVA 350
C                                                                      BOVA 351
      NRFL=ICORE(6)+L6                                                 BOVA 352
      I=6                                                              BOVA 353
      WRITE (IO,260) I,ICORE(I),NRFL                                   BOVA 354
      ICORE(I)=NRFL                                                    BOVA 355
C                                                                      BOVA 356
      NRFL=ICORE(7)+L7                                                 BOVA 357
      I=7                                                              BOVA 358
      WRITE (IO,260) I,ICORE(I),NRFL                                   BOVA 359
      ICORE(I)=NRFL                                                    BOVA 360
C                                                                      BOVA 361
      NRFL=ICORE(8)+F(30)                                              BOVA 362
      I=8                                                              BOVA 363
      WRITE (IO,260) I,ICORE(I),NRFL                                   BOVA 364
      ICORE(I)=NRFL                                                    BOVA 365
C                                                                      BOVA 366
      NRFL=ICORE(9)                                                    BOVA 367
      I=9                                                              BOVA 368
      WRITE (IO,260) I,ICORE(I),NRFL                                   BOVA 369
C                                                                      BOVA 370
      NRFL=ICORE(10)+G(14)                                             BOVA 371
      I=10                                                             BOVA 372
      WRITE (IO,260) I,ICORE(I),NRFL                                   BOVA 373
      ICORE(I)=NRFL                                                    BOVA 374
C                                                                      BOVA 375
C                                                                      BOVA 376
C     READ AND INITIALIZE INFORMATION                                  BOVA 377
C                                                                      BOVA 378
      IRS=1                                                            BOVA 379
      CALL REQMEM(ICORE(5))                                            BOVA 380
      CALL OVERLAY (4LECCP,5,0)                                        BOVA 381
C                                                                      BOVA 382
C     READ DATA FOR SLAE                                               BOVA 383
C                                                                      BOVA 384
      CALL REQMEM(ICORE(1))                                            BOVA 385
      CALL OVERLAY (4LECCP,1,0)                                        BOVA 386
C                                                                      BOVA 387
C     SET UP TAPES FOR STIFFNESS MATRIX FORMULATION                    BOVA 388
C                                                                      BOVA 389
      I12=NCNS                                                         BOVA 390
      I22=NCNS                                                         BOVA 391
      I32=NCNS                                                         BOVA 392
      ITN=19                                                           BOVA 393
      ITO=20                                                           BOVA 394
      CALL REQMEM(ICORE(6))                                            BOVA 395
      CALL OVERLAY (4LECCP,6,0)                                        BOVA 396
      ITN=21                                                           BOVA 397
      ITO=22                                                           BOVA 398
      CALL REQMEM(ICORE(6))                                            BOVA 399
      CALL OVERLAY (4LECCP,6,0)                                        BOVA 400
C                                                                      BOVA 401
      IF (NBEAMX.EQ.0) GO TO 270                                       BOVA 402
C                                                                      BOVA 403
C     READ DATA FOR BEAM                                               BOVA 404
C                                                                      BOVA 405
      CALL REQMEM(ICORE(8))                                            BOVA 406
      CALL OVERLAY (4LECCP,8,0)                                        BOVA 407
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C                                                                       BOVA 408
C     SET UP TAPES FOR STIFFNESS MATRIx FORMULATION                     BOVA 409
C                                                                       BOVA 410
      ITN=23                                                            BOVA 411
      ITO=24                                                            BOVA 412
      CALL REQMEM(ICORE(7))                                             BOVA 413
      CALL OVERLAY (4LECCP,7,0)                                         BOVA 414
      ITN=15                                                            BOVA 415
      ITO=16                                                            BOVA 416
      CALL REQMEM(ICORE(7))                                             BOVA 417
      CALL OVERLAY (4LECCP,7,0)                                         BOVA 418
C                                                                       BOVA 419
C     IS THERE A PRESTRESS OR DEAD LOAD SOLUTION FOR BEAMS              BOVA 420
C                                                                       BOVA 421
      IF (KPS.EQ.0) GO TO 270                                           BOVA 422
C                                                                       BOVA 423
C     IS THIS A RESTART RUN                                             BOVA 424
C                                                                       BOVA 425
      IF (ICARDS.EQ.3HYES) GO TO 270                                    BOVA 426
C                                                                       BOVA 427
C     OBTAIN SOLUTIONS FOR INDIVIDUAL BEAMS                             BOVA 428
C                                                                       BOVA 429
      CALL REQMEM(ICORE(4))                                             BOVA 430
      CALL OVERLAY (4LECCP,4,0)                                         BOVA 431
C                                                                       BOVA 432
C     WRITE TO TAPE USED FOR STIFFNESS MATRIX FORMULATION               BOVA 433
C                                                                       BOVA 434
      ITN=15                                                            BOVA 435
      ITO=16                                                            BOVA 436
      CALL REQMEM(ICORE(7))                                             BOVA 437
      CALL OVERLAY (4LECCP,7,0)                                         BOVA 438
  270 CONTINUE                                                          BOVA 439
C                                                                       BOVA 440
C     CHECK IF THIS IS A RESTART RUN                                    BOVA 441
C                                                                       BOVA 442
      IF (ICARDS.EQ.3HYES) ISRCH=3HNO                                   BOVA 443
      IF (ICARDS.EQ.3HYES) IDEAD=3H NO                                  BOVA 444
      IF (ICARDS.EQ.3HYES) ISCALE=3H NO                                 BOVA 445
      IF (ICARDS.EQ.3HYES) GO TO 280                                    BOVA 446
C                                                                       BOVA 447
C     OBTAIN SOLUTION TO DETERMINE STRAIN POSITION                      BOVA 448
C     WITHIN ELEMENTS                                                   BOVA 449
C                                                                       BOVA 450
      CALL REQMEM(ICORE(2))                                             BOVA 451
      IF (ISRCH.EQ.3HYES) CALL OVERLAY (4LECCP,2,0)                     BOVA 452
      CALL REQMEM(ICORE(3))                                             BOVA 453
      IF (ISRCH.EQ.3HYES) CALL OVERLAY (4LECCP,3,0)                     BOVA 454
      IRS=7                                                             BOVA 455
      CALL REQMEM(ICORE(5))                                             BOVA 456
      CALL OVERLAY (4LECCP,5,0)                                         BOVA 457
C                                                                       BOVA 458
C     SET A RETURN CODE                                                 BOVA 459
C                                                                       BOVA 460
      IRS=3                                                             BOVA 461
C                                                                       BOVA 462
C     CHECK FOR DEAD LOAD                                               BOVA 463
C                                                                       BOVA 464
      IF (IDEAD.EQ.3HYES) IRS=6                                         BOVA 465
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      IF (IDEAD.EQ.3HYES) GO TO 310                                     BOVA 466
C                                                                       BOVA 467
C     CHECK FOR SCALING                                                 BOVA 468
C                                                                       BOVA 469
      IF (ISCALE.NE.3HYES) GO TO 280                                    BOVA 470
      GO TO 310                                                         BOVA 471
C                                                                       BOVA 472
C*****************************************************************************BOVA 473
C     OVERLOAD SOLUTION PROCEDURE                                       BOVA 474
C*****************************************************************************BOVA 475
C                                                                       BOVA 476
  280 CONTINUE                                                          BOVA 477
      CALL REQMEM(ICORE(5))                                             BOVA 478
      CALL OVERLAY (4LECCP,5,0)                                         BOVA 479
      GO TO (310,300,290,320), IOUTS                                    BOVA 480
  290 CONTINUE                                                          BOVA 481
C                                                                       BOVA 482
C     SET UP BEAM TAPE                                                  BOVA 483
C                                                                       BOVA 484
      ITN=15                                                            BOVA 485
      ITO=16                                                            BOVA 486
      CALL REQMEM(ICORE(7))                                             BOVA 487
      IF (NBEAMX.NE.0) CALL OVERLAY (4LECCP,7,0)                        BOVA 488
  300 CONTINUE                                                          BOVA 489
C                                                                       BOVA 490
C     SET UP SLAB TAPE                                                  BOVA 491
C                                                                       BOVA 492
      ITN=21                                                            BOVA 493
      ITO=22                                                            BOVA 494
      CALL REQMEM(ICORE(6))                                             BOVA 495
      CALL OVERLAY (4LECCP,6,0)                                         BOVA 496
  310 CONTINUE                                                          BOVA 497
C                                                                       BOVA 498
C     SET UP SLAB TAPE                                                  BOVA 499
C                                                                       BOVA 500
      ITN=19                                                            BOVA 501
      ITO=20                                                            BOVA 502
      CALL REQMEM(ICORE(6))                                             BOVA 503
      CALL OVERLAY (4LECCP,6,0)                                         BOVA 504
C                                                                       BOVA 505
C     SET UP BEAM TAPE                                                  BOVA 506
C                                                                       BOVA 507
      ITN=23                                                            BOVA 508
      ITO=24                                                            BOVA 509
      CALL REQMEM(ICORE(7))                                             BOVA 510
      IF (NBEAMX.NE.0) CALL OVERLAY (4LECCP,7,0)                        BOVA 511
C                                                                       BOVA 512
C     SET UP STIFFNESS MATRIX AND SOLVE                                 BOVA 513
C                                                                       BOVA 514
      CALL REQMEM(ICORE(2))                                             BOVA 515
      CALL OVERLAY (4LECCP,2,0)                                         BOVA 516
      CALL REQMEM(ICORE(3))                                             BOVA 517
      CALL OVERLAY (4LECCP,3,0)                                         BOVA 518
      GO TO 280                                                         BOVA 519
  320 CONTINUE                                                          BOVA 520
C                                                                       BOVA 521
C     DO PRINTER PLOTS                                                  BOVA 522
C                                                                       BOVA 523
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      CALL REQMEM(ICORE(10))                                          BOVA 524
      CALL OVERLAY (4LECCP,10,0)                                      BOVA 525
      GO TO 280                                                       BOVA 526
C                                                                     BOVA 527
      STOP                                                            BOVA 528
      END                                                             BOVA 529
      SUBROUTINE BAXIAL (S1,S2,AL,SP,EP,DIRECT,E1B)                   BAXIAL 2
C                                                                     BAXIAL 3
C     BIAXIAL STRESS-STRAIN RELATION FOR THE SLAB CONCRETE LAYER      BAXIAL 4
C                                                                     BAXIAL 5
C     STRESS STATE MAY FALL INTO ONE OF FOUR REGIONS                  BAXIAL 6
C     REFER TO FRITZ LAB REPORT 3788.3 FOR DETAILS                    BAXIAL 7
C                                                                     BAXIAL 8
      COMMON /PROPCB/ ZA,EZA,ZB,EZB                                   BAXIAL 9
      COMMON /PROPC/ V,EC,FC,ECOMP,FT,ET,PCOMP,ALMM,SALMM,EALMM,ALICC BAXIAL10
      COMMON /TYPENN/ TYPE                                            BAXIAL11
C                                                                     BAXIAL12
C     INITIALIZE                                                      BAXIAL13
C                                                                     BAXIAL14
      RV=1.0/V                                                        BAXIAL15
      SIGNR=1.0                                                       BAXIAL16
      TYPE=5HNONLR                                                    BAXIAL17
      EPEAK=0.0                                                       BAXIAL18
      DIRECT=5HNONE                                                   BAXIAL19
      IF (S1.EQ.0.0) GO TO 110                                        BAXIAL20
C                                                                     BAXIAL21
C     SET REGION CODE                                                 BAXIAL22
C                                                                     BAXIAL23
      AL=S2/S1                                                        BAXIAL24
      IF (ABS(1.0-AL*V).LT.1.0E-012) AL=AL-AL*0.000001                BAXIAL25
      IA=2                                                            BAXIAL26
      IF (S1.GT.0.0) IA=0                                             BAXIAL27
      IB=2                                                            BAXIAL28
      IF (S2.GT.0.0) IB=1                                             BAXIAL29
      ICODE=IA+IB                                                     BAXIAL30
C                                                                     BAXIAL31
C     TRANSFERE TO STRESS SPACE REGION                                BAXIAL32
C                                                                     BAXIAL33
      GO TO (10,50,70,90), ICODE                                      BAXIAL34
C                                                                     BAXIAL35
   10 CONTINUE                                                        BAXIAL36
C                                                                     BAXIAL37
C     COMP.-COMP. REGION                                              BAXIAL38
C                                                                     BAXIAL39
      IF (AL.GE.0.0.AND.AL.LT.V) GO TO 20                             BAXIAL40
      IF (AL.GE.V.AND.AL.LE.1.0) GO TO 30                             BAXIAL41
      IF (AL.GT.1.0.AND.AL.LE.RV) GO TO 40                            BAXIAL42
      SP=1.2*FC/(1.2*AL-1.0)                                          BAXIAL43
      EP=V*ECOMP*(SP/(1.2*V*FC)-1.0)*1.0E-06                          BAXIAL44
      ES=SP/EP                                                        BAXIAL45
      SIGNR=-1.0                                                      BAXIAL46
      CALL ESLOPE (SP,EP,ES,AL,EPEAK,SIGNR,S1,E1B)                    BAXIAL47
      RETURN                                                          BAXIAL48
C                                                                     BAXIAL49
   20 CONTINUE                                                        BAXIAL50
      SP=(1.2*FC)/(1.2-AL)                                            BAXIAL51
      EP=ECOMP*1.0E-06                                                BAXIAL52
      ES=SP/EP                                                        BAXIAL53
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      CALL ESLOPE (SP,EP,ES,AL,EPEAK,SIGNR,S1,E1B)                    BAXIAL54
      DIRECT=5HCRUSH                                                  BAXIAL55
      RETURN                                                          BAXIAL56
C                                                                     BAXIAL57
   30 CONTINUE                                                        BAXIAL58
      SP=1.2*FC                                                       BAXIAL59
      EP=ECOMP*1.0E-06                                                BAXIAL60
      ES=SP/EP                                                        BAXIAL61
      DIRECT=5HCRUSH                                                  BAXIAL62
      CALL ESLOPE (SP,EP,ES,AL,EPEAK,SIGNR,S1,E1B)                    BAXIAL63
      RETURN                                                          BAXIAL64
C                                                                     BAXIAL65
   40 CONTINUE                                                        BAXIAL66
      SP=1.2*FC/AL                                                    BAXIAL67
      EP=(ECOMP/(1.2*(1.0-V)))*(SP/FC-1.2*V)*1.0E-06                  BAXIAL68
      ES=SP/EP                                                        BAXIAL69
      CALL ESLOPE (SP,EP,ES,AL,EPEAK,SIGNR,S1,E1B)                    BAXIAL70
      RETURN                                                          BAXIAL71
C                                                                     BAXIAL72
   50 CONTINUE                                                        BAXIAL73
C                                                                     BAXIAL74
C     COMP.- TENSION REGION                                           BAXIAL75
C                                                                     BAXIAL76
      ALIM=1.0/ALMM                                                   BAXIAL77
C     REGION 20                                                       BAXIAL78
      SP=(ALIM-AL)/FT+1.0/(SALMM*FC)                                  BAXIAL79
      SP=1.0/SP                                                       BAXIAL80
C     REGION 21                                                       BAXIAL81
      IF (AL.GE.ALIM) SP=FC/(1.0+AL*(1.0-SALMM)/(ALIM*SALMM))         BAXIAL82
C     REGION 20                                                       BAXIAL83
      EP=((PCOMP-V*ET)*SP/(EALMM*FC)+V*ET)*1.0E-06                    BAXIAL84
C     REGION 21                                                       BAXIAL85
      IF (SP.GE.EALMM*FC) EP=((ECOMP-PCOMP)*(SP/FC-1.0)/(1.0-EALMM)+ECOMBAXIAL86
     1P)*1.0E-06                                                      BAXIAL87
      ES=SP/EP                                                        BAXIAL88
      IF (AL.GE.1.0/ALICC) DIRECT=5HCRUSH                             BAXIAL89
      ECP=EZA+(EZA-EZB)*(AL-ZA)/(ZA-ZB)                               BAXIAL90
      IF (ECP.GE.1.0) GO TO 60                                        BAXIAL91
      IF (ECP.LT.0.0) ECP=0.0                                         BAXIAL92
      EPEAK=ECP*EC/(1.0-V*AL)                                         BAXIAL93
      IF (EPEAK.GE.ES) GO TO 60                                       BAXIAL94
      IF(EPEAK.NE.0.0) TYPE=5HLINRR                                   BAXIAL95
      CALL ESLOPE (SP,EP,ES,AL,EPEAK,SIGNR,S1,E1B)                    BAXIAL96
      RETURN                                                          BAXIAL97
   60 CONTINUE                                                        BAXIAL98
      E1B=ES                                                          BAXIAL99
      TYPE=5HLINER                                                    BAXIA100
      RETURN                                                          BAXIA101
C                                                                     BAXIA102
   70 CONTINUE                                                        BAXIA103
C                                                                     BAXIA104
C     TENSION - COMP. REGION                                          BAXIA105
C                                                                     BAXIA106
C     REGION 30                                                       BAXIA107
      SP=ALMM*(1.0/SALMM-1.0)+AL                                      BAXIA108
      SP=FC/SP                                                        BAXIA109
C     REGION 31                                                       BAXIA110
      IF (AL.GT.ALMM) SP=FT/(AL*(1.0/ALMM+FT/(SALMM*FC))-1.0)         BAXIA111
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C     REGION 30                                                    BAXIA112
C     REGION 31                                                    BAXIA113
      EP=((ET-V*ECOMP)*(SP/FT+1.0)-ET)*1.0E-06                     BAXIA114
      ES=SP/EP                                                     BAXIA115
      IF (AL.GT.ALICC) DIRECT=5HCRACK                              BAXIA116
      ECP=EZA+(EZA-EZB)*(1.0/AL-ZA)/(ZA-ZB)                        BAXIA117
      IF (ECP.GE.1.0) GO TO 80                                     BAXIA118
      IF (ECP.LT.0.0) ECP=0.0                                      BAXIA119
      EPEAK=ECP*EC/(1.0-V*AL)                                      BAXIA120
      IF (EPEAK.GE.ES) GO TO 80                                    BAXIA121
      IF(EPEAK.NE.0.0) TYPE= 5HLINRR                               BAXIA122
      SIGNR=-1.0                                                   BAXIA123
      CALL ESLOPE (SP,EP,ES,AL,EPEAK,SIGNR,S1,E1B)                 BAXIA124
      RETURN                                                       BAXIA125
   80 CONTINUE                                                     BAXIA126
      E1B=ES                                                       BAXIA127
      TYPE=5HLINER                                                 BAXIA128
      RETURN                                                       BAXIA129
C                                                                  BAXIA130
   90 CONTINUE                                                     BAXIA131
C                                                                  BAXIA132
C     TENSION -TENSION REGION                                      BAXIA133
C                                                                  BAXIA134
      IF (AL.LE.1.0) GO TO 100                                     BAXIA135
      SP=-FT/AL                                                    BAXIA136
      ES=EC/(1.0-V*AL)                                             BAXIA137
      EP=SP/ES                                                     BAXIA138
      TYPE=5HLINER                                                 BAXIA139
      E1B=ES                                                       BAXIA140
      RETURN                                                       BAXIA141
C                                                                  BAXIA142
  100 CONTINUE                                                     BAXIA143
      SP=-FT                                                       BAXIA144
      ES=EC/(1.0-V*AL)                                             BAXIA145
      EP=SP/ES                                                     BAXIA146
      TYPE=5HLINER                                                 BAXIA147
      E1B=ES                                                       BAXIA148
      DIRECT=5HCRACK                                               BAXIA149
      RETURN                                                       BAXIA150
C                                                                  BAXIA151
  110 CONTINUE                                                     BAXIA152
      AL=0.0                                                       BAXIA153
      IF (S2.GT.0.0) GO TO 120                                     BAXIA154
      IF (S2.LT.0.0) GO TO 130                                     BAXIA155
C                                                                  BAXIA156
C     FOR S2 EQUAL TO ZERO                                         BAXIA157
C     ZERO STRESS IN TWO PRINCIPAL DIRECTIONS                      BAXIA158
C                                                                  BAXIA159
      SP=FC                                                        BAXIA160
      EP=ECOMP*1.0E-06                                             BAXIA161
      E1B=EC                                                       BAXIA162
      ES=EC                                                        BAXIA163
      RETURN                                                       BAXIA164
C                                                                  BAXIA165
  120 CONTINUE                                                     BAXIA166
C                                                                  BAXIA167
C     FOR TENSILE STRAINS IN DIRECTION OF INTREST                  BAXIA168
C                                                                  BAXIA169
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      EP=-V*ECOMP*1.0E-06                                                BAXIA170
      SP=0.0                                                             BAXIA171
      ES=0.0                                                             BAXIA172
      E1B=0.0                                                            BAXIA173
      RETURN                                                             BAXIA174
C                                                                        BAXIA175
  130 CONTINUE                                                           BAXIA176
C                                                                        BAXIA177
C     FOR COMPRESSIVE STRAINS IN DIRECTION OF INTREST                    BAXIA178
C                                                                        BAXIA179
      EP=V*ET*1.0E-06                                                    BAXIA180
      SP=0.0                                                             BAXIA181
      ES=0.0                                                             BAXIA182
      DIRECT=5HCRACK                                                     BAXIA183
      E1B=ES                                                             BAXIA184
      RETURN                                                             BAXIA185
      END                                                                BAXIA186
      SUBROUTINE ESLOPE (SP,EP,ES,AL,EPEAK,SIGNR,S1,E1B)                 ESLOPE  2
C                                                                        ESLOPE  3
C     FIND THE INSTANTANEOUS SLOPE OF THE STRESS-STRAIN CURVE            ESLOPE  4
C                                                                        ESLOPE  5
      COMMON /PROPC/ V,EC,FC,ECOMP,FT,ET,PCOMP,ALMM,SALMM,EALMM,ALICC    ESLOPE  6
      E1B=0.0                                                            ESLOPE  7
      IF (ABS(S1).GE.ABS(SP)) RETURN                                     ESLOPE  8
      F=EC/(1.0-V*AL)                                                    ESLOPE  9
      D=(1.0-EPEAK*F/(ES*ES))/(EP*EP)                                    ESLOPE10
      C=F/(ES*EP)-1.0/EP-D*EP                                            ESLOPE11
      G=(F/S1-C)**2-4.0*D                                                ESLOPE12
      IF (G.LT.0.0) G=0.0                                                ESLOPE13
      E=(F/S1-C-SQRT(G)*SIGNR)/(2.0*D)                                   ESLOPE14
      E1B=S1*S1*(1.0/(F*E*E)-D/F)                                        ESLOPE15
      RETURN                                                             ESLOPE16
      END                                                                ESLOPE17
      SUBROUTINE PRNCIP (SXX,SYY,SXY,S1,S2,THETA)                        PRNCIP  2
C                                                                        PRNCIP  3
C     FIND PRINCIPAL STRESSES                                            PRNCIP  4
C                                                                        PRNCIP  5
      A=(SXX+SYY)/2.                                                     PRNCIP  6
      C=(SXX-SYY)/2.0                                                    PRNCIP  7
      B=SQRT(C*C+SXY*SXY)                                                PRNCIP  8
      IF (B.LT.1.0E-12) GO TO 10                                         PRNCIP  9
      IF (SXX.LT.A) B=-B                                                 PRNCIP10
      S1=A+B                                                             PRNCIP11
      S2=A-B                                                             PRNCIP12
      IF (ABS(C).LT.1.00E-12) GO TO 20                                   PRNCIP13
      THETA=0.5*(ATAN(SXY/C))*57.29578                                   PRNCIP14
      GO TO 30                                                           PRNCIP15
   10 THETA=0.0                                                          PRNCIP16
      S1=A                                                               PRNCIP17
      S2=A                                                               PRNCIP18
      GO TO 30                                                           PRNCIP19
   20 THETA=45.0                                                         PRNCIP20
      IF ((SXY*B).LT.0.) THETA=-45.                                      PRNCIP21
   30 RETURN                                                             PRNCIP22
      END                                                                PRNCIP23
      SUBROUTINE TRANS (DD,THETA,DDD)                                    TRANS   2
C                                                                        TRANS   3
C     ROTATE THE ELASTICITY MATRIX TO A DIFFERENT COORDINATE SYSTEM      TRANS   4
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C                                                                       TRANS   5
      DIMENSION DD(3,3), DDD(3,3), A(3,3), T(3,3), TT(3,3)              TRANS   6
C                                                                       TRANS   7
C     TRANSFORMATION MATRIX T                                           TRANS   8
C                                                                       TRANS   9
      RAD=THETA/57.29578                                                TRANS  10
      C=COS(RAD)                                                        TRANS  11
      S=SIN(RAD)                                                        TRANS  12
      T(1,1)=T(2,2)=C*C                                                 TRANS  13
      T(1,2)=T(2,1)=S*S                                                 TRANS  14
      T(1,3)=-2.0*C*S                                                   TRANS  15
      T(2,3)=-T(1,3)                                                    TRANS  16
      T(3,1)=-T(1,3)/2.0                                                TRANS  17
      T(3,2)=-T(3,1)                                                    TRANS  18
      T(3,3)=T(1,1)-T(1,2)                                              TRANS  19
C                                                                       TRANS  20
C     TRANSPOSE T TO GET TT                                             TRANS  21
C                                                                       TRANS  22
      DO 10 I=1,3                                                       TRANS  23
      DO 10 J=1,3                                                       TRANS  24
   10 TT(I,J)=T(J,I)                                                    TRANS  25
C                                                                       TRANS  26
C     FORM TRANSFORMED ELASTICITY MATRIX DDD       A = DD*TT            TRANS  27
C                                                                       TRANS  28
      DO 30 J=1,3                                                       TRANS  29
      DO 30 I=1,3                                                       TRANS  30
      SUM=0.0                                                           TRANS  31
      DO 20 K=1,3                                                       TRANS  32
   20 SUM=SUM+DD(I,K)*TT(K,J)                                           TRANS  33
      A(I,J)=SUM                                                        TRANS  34
   30 CONTINUE                                                          TRANS  35
C                                                                       TRANS  36
C     FORM TRANSFORMED ELASTICITY MATRIX DDD       DDD = T*DD*TT        TRANS  37
C                                                                       TRANS  38
      DO 50 J=1,3                                                       TRANS  39
      DO 50 I=1,3                                                       TRANS  40
      SUM=0.0                                                           TRANS  41
      DO 40 K=1,3                                                       TRANS  42
   40 SUM=SUM+T(I,K)*A(K,J)                                             TRANS  43
      DDD(I,J)=SUM                                                      TRANS  44
   50 CONTINUE                                                          TRANS  45
      RETURN                                                            TRANS  46
      END                                                               TRANS  47
      SUBROUTINE TRANG (SX,SY,SXY,ANG,S1,S2,S3)                         TRANG   2
C                                                                       TRANG   3
C     TRANSFORMATION OF STRESS AND STRAIN TO CRACKED AXIS               TRANG   4
C     EXY = 0.5*ENGINEERING STRAIN                                      TRANG   5
C     E3 =0.5*ENGINEERING STRAIN                                        TRANG   6
C                                                                       TRANG   7
      DIMENSION SS(3), T(3,3), SP(3)                                    TRANG   8
C                                                                       TRANG   9
      SS(1)=SX                                                          TRANG  10
      SS(2)=SY                                                          TRANG  11
      SS(3)=SXY                                                         TRANG  12
      RAD=ANG/57.29578                                                  TRANG  13
      C=COS(RAD)                                                        TRANG  14
      S=SIN(RAD)                                                        TRANG  15
      T(1,1)=C*C                                                        TRANG  16
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      T(1,2)=S*S                                                        TRANG 17
      T(1,3)=2.0*S*C                                                    TRANG 18
      T(2,1)=T(1,2)                                                     TRANG 19
      T(2,2)=T(1,1)                                                     TRANG 20
      T(2,3)=-T(1,3)                                                    TRANG 21
      T(3,1)=-C*S                                                       TRANG 22
      T(3,2)=-T(3,1)                                                    TRANG 23
      T(3,3)=T(1,1)-T(1,2)                                              TRANG 24
C                                                                       TRANG 25
      DO 20 I=1,3                                                       TRANG 26
      SUMS=0.0                                                          TRANG 27
      DO 10 J=1,3                                                       TRANG 28
      A=T(I,J)                                                          TRANG 29
   10 SUMS=A*SS(J)+SUMS                                                 TRANG 30
   20 SP(I)=SUMS                                                        TRANG 31
C                                                                       TRANG 32
      S1=SP(1)                                                          TRANG 33
      S2=SP(2)                                                          TRANG 34
      S3=SP(3)                                                          TRANG 35
      RETURN                                                            TRANG 36
      END                                                               TRANG 37
      OVERLAY  (ECCP,5,0)                                               OVERL5 2
      PROGRAM OVERL5                                                    OVERL5 3
C                                                                       OVERL5 4
C     THIS SETS UP SPACE FOR BLANK COMMON                               OVERL5 5
C         AND  CALLS SUBROUTINE  CONTROL                                OVERL5 6
C                                                                       OVERL5 7
      COMMON /CBS301/ COUPLE                                            OVERL5 8
      COMMON /PROPC/ V(11)                                              OVERL5 9
      COMMON /ITAPE/ ITN,ITO,I12,I22,I32                                OVERL510
      COMMON /PROPC8/ ZA,EZA,ZB,EZB                                     OVERL511
      COMMON /EDOWN/ DUMMY5(2)                                          OVERL512
      COMMON /SIGNIF/ NSIGNI                                            OVERL513
      COMMON /TFAIL/ TOLF                                               OVERL514
      COMMON /TUOO/ TUO(8,12)                                           OVERL515
      COMMON /PFACT/ PFC                                                OVERL516
      COMMON /PLTCO/ PLTCRD                                             OVERL517
      COMMON /COMPLT/ ICMPLT                                            OVERL518
      COMMON /CB300/ NPERBM,NREADB,KSIG,KIN,KC,KMAT,KPS,NCBM,NNN        OVERL519
      COMMON /CB305/ PCTT,PCTC                                          OVERL520
      COMMON /CB309/ FTOL,CTOL                                          OVERL521
      COMMON /CB310/ NELX,NSMAT,NELY                                    OVERL522
      COMMON /CB311/ PRINTB,PRINTS,DGX,DGY                              OVERL523
      COMMON /SCALED/ ISCALE,IFN                                        OVERL524
      COMMON /DEADL/ IDEAD,ITERD,NITERD,ITRALD                          OVERL525
      COMMON /SEARCH/ ISRCH                                             OVERL526
      COMMON /CB01/ NUMEL,NANA,NUMNP,NETA,NA1,NULAY,NSLAYR,NCNS         OVERL527
      COMMON /CB2/ NBEAMX,NIX,NULAYB                                    OVERL528
      COMMON /CB3/ LWIDTH,NITA,NPSEGM                                   OVERL529
      COMMON /CB4/ IN,IC                                                OVERL530
      COMMON /BDIM/ RON(48)                                             OVERL531
      COMMON /PDIM/ PDT(70)                                             OVERL532
      COMMON /ICARD/ ICARDS                                             OVERL533
      COMMON /SMX/ OLOAD,PMAX                                           OVERL534
      COMMON /BTCHK/ STRAMX(30)                                         OVERL535
      COMMON /HISTB/ NVALB(30),IVALB(60)                                OVERL536
      COMMON /STCHK/ STRAMS(30)                                         OVERL537
      COMMON /HISTS/ NVALS(30),IVALS(60)                                OVERL538
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      COMMON /CRWS/ CRS(10)                                                 OVERL539
      COMMON /CRWB/ CRB(10)                                                 OVERL540
      COMMON /HIST/ NVAL(10),IVAL(10),FVAL(10)                              OVERL541
      COMMON /SAVE/ AA(39)                                                  OVERL542
      COMMON /PRECK/ PRECRK                                                 OVERL543
      COMMON /ICORES/ ICR(4),ICCRE                                          OVERL544
      COMMON /FLOW/ IRS,ICUTS                                               OVERL545
      COMMON /OVER5/ N1,N2,N3,N4,N5,N6,N7,N8,N9,N10,N11,N12,N13,N14,N15,OVERL546
     1N16,N17,N18,N19,N20,N21,N22,N23,N24,N25,N26,N27,N28,N29,N30,N31,N3OVERL547
     22,N33,N34,N35,N36,N37,N38,N39,N40,N41,N42,N43,N44,N45,N46,N47,N48,OVERL548
     3N49,N50,N51,N52,N53                                                 OVERL549
      COMMON A(1)                                                           OVERL550
C                                                                           OVERL551
      IF (ICORE.NE.0) GO TO 10                                              OVERL552
      ICORE=LOCF(A(1))+1                                                    OVERL553
      GO TO 20                                                              OVERL554
   10 CONTINUE                                                              OVERL555
      CALL CONTRL (NA1,NUMEL,NCNS,NULAY,NPERBM,NULAYB,NPEAMX,A(N1),A(N2)OVERL556
     1,A(N3),A(N4),A(N5),A(N6),A(N7),A(N8),A(N9),A(N10),A(N11),A(N12),A(OVERL557
     2N13),A(N14),A(N15),A(N16),A(N17),A(N18),A(N19),A(N20),A(N21),A(N22OVERL558
     3),A(N23),A(N24),A(N25),A(N26),A(N27),A(N28),A(N29),A(N30),A(N31),AOVERL559
     4(N32),A(N33),A(N34),A(N35),A(N36),A(N37),A(N38),A(N39),A(N40),A(N4OVERL560
     51),A(N42),A(N43),A(N44),A(N45),A(N46),A(N47),A(N48),A(N49),A(N50),OVERL561
     6A(N51),A(N52))                                                      OVERL562
   20 CONTINUE                                                              OVERL563
      END                                                                   OVERL564
      SUBROUTINE CONTRL (P,C,D,E,F,G,H,FORCE,LILA,FORCEA,DISPLA,DISP,DISCONTRL  2
     1PO,FORCEB,FCADD,FCSADD,CTXX,CTYY,CTXY,ETXX,ETYY,ETXY,CUXX,CUYY,CUXCONTRL  3
     2Y,EIXX,EIYY,EIXY,AS1,AF,AS,SIGXXO,SIGYYO,SIGXYO,SXXOT,SYYOT,SXYOT,CONTRL  4
     3EXTRA,EXTRA1,EXTRA2,EXTRA3,EXTRA4,EXTRA5,EXTRA6,EXTRA7,EIB,CUB,DUMCONTRL  5
     4,EPSPS,SIBXXA,SIBXXC,ASXLR,AILR,ZCRD,TSHEAR,ITYPE,ESX,AFT,AST)     CONTRL  6
C                                                                           CONTRL  7
C     THIS SUBROUTINE CONTROLS THE PROGRAM FLOW FOR DATA INPUT,             CONTRL  8
C          RESTART, DEAD LOAD SOLUTION FOR THE WHOLE STRUCTURE,             CONTRL  9
C          SCALING, AND INCREMENTAL SOLUTION UP TO FAILURE                  CONTRL10
C                                                                           CONTRL11
      COMMON /CBS301/ COUPLE                                                CONTRL12
      COMMON /PROPC/ V(11)                                                  CONTRL13
      COMMON /ITAPE/ ITN,ITO,I12,I22,I32                                    CONTRL14
      COMMON /PROPCB/ ZA,EZA,ZB,EZE                                         CONTRL15
      COMMON /EDOWN/ DUMMY5(2)                                              CONTRL16
      COMMON /SIGNIF/ NSIGNI(2)                                             CONTRL17
      COMMON /TFAIL/ TOLF                                                   CONTRL18
      COMMON /TUOO/ TUO(8,12)                                               CONTRL19
      COMMON /PFACT/ PFC                                                    CONTRL20
      COMMON /SMX/ OLOAD,PMAX                                               CONTRL21
      COMMON /HISTB/ NVALB(6,5),IVALB(6,2,5)                                CONTRL22
      COMMON /HISTS/ NVALS(6,5),IVALS(6,2,5)                                CONTRL23
      COMMON /HIST/ NVAL(10),IVAL(10),FVAL(10)                              CONTRL24
      COMMON /PLTCD/ PLTCRD                                                 CONTRL25
      COMMON /COMPLT/ ICMPLT                                                CONTRL26
      COMMON /PRECK/ PRECRK                                                 CONTRL27
      COMMON /SCALED/ ISCALE,IFN                                            CONTRL28
      COMMON /DEADL/ IDEAD,ITERD,NITERD,ITRALD                              CONTRL29
      COMMON /SEARCH/ ISRCH,ISRT                                            CONTRL30
      COMMON /CRWS/ CRS1,CRS2,CRS3,CRS4,CRS5,CRS6,CRS7,ICRS8,CRS9,ICRS10CONTRL31
      COMMON /CRWB/ CRB1,ICRB2,CRB3,CRB4,ICRB5,ICRB6,ICRB7,CRB8,CRB9,CRBCONTRL32
      110                                                                   CONTRL33
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      COMMON /CB300/ NPERBM,NREADB,KSIG,KIN,KC,KMAT,KPS,NOBM,NNN          CONTRL34
      COMMON /CB305/ PCTT,PCTC                                            CONTRL35
      COMMON /CB309/ FTOL,CTOL                                            CONTRL36
      COMMON /CB310/ NELX,NSMAT,NELY                                      CONTRL37
      COMMON /CB311/ PRINTB,PRINTS,DGX,DGY                                CONTRL38
      COMMON /CB01/ NUMEL,NANA,NUMNP,NETA,NA1,NULAY,NSLAYR,NCNS           CONTRL39
      COMMON /CB2/ NBEAMX,NIX,NULAYB                                      CONTRL40
      COMMON /CB3/ LWIDTH,NITA,NPSEGM                                     CONTRL41
      COMMON /CB4/ IN,IO                                                  CONTRL42
      COMMON /PDIM/ PDT(15),PZC(15),SEMOD(4),SIGMAP(4),SPRON(4),SPROM(4)CONTRL43
     1,NSTYPE(6),SDT(6),SZC(6),SPHI(6)                                    CONTRL44
      COMMON /BDIM/ RON(6),ROM(6),EDOWN(6),STRAN(6),SIGC(6),FT(6),RONT(3CONTRL45
     1),ROMT(3),EDOWNT(3),EDOWNR(3)                                       CONTRL46
      COMMON /ICARD/ ICARDS                                               CONTRL47
      COMMON /SAVE/ AA,CODEA,CODET,DPFC,DSPMAX,ECARDS,ETIME,HDISP,HFORCECONTRL48
     1,CQAPA,QAPA,RQAPA,QAPAC,ICHECK,NCHECK,ICON,ICYCLE,LCYCLE,INOTEN,IOCONTRL49
     2NE,IOUT,ITER,NITER,LITER,ITRIAL,NTRIAL,LTRIAL,ITP,RATIOP,RATIOY,RRCONTRL50
     3ATIO,RFORCE,ROLD,TOLDSP,RDPR,RFPR,RDFPR,RDOLD,RFOLD                 CONTRL51
      COMMON /FLOW/ IRS,ICUTS                                             CONTRL52
      INTEGER P,C,D,E,F,G,H                                               CONTRL53
C     P = NA1, C = NUMEL, D = NCNS, E = NULAY, F = NPEREM, G = NULAYB     CONTRL54
C     H = NBEAMX                                                          CONTRL55
C                                                                         CONTRL56
      DIMENSION FORCE(P), LILA(P), FORCEA(P), DISPLA(P), DISP(P), DISPO(CONTRL57
     1P), FCADD(P), FCSADD(P), FORCEB(P), CTXX(C), CTYY(C), CTXY(C), CUXCONTRL58
     2X(C), CUYY(C), CUXY(C), ETXX(C), ETYY(C), ETXY(C), EIXX(C), EIYY(CCONTRL59
     3), EIXY(C), SIGXXO(D), SIGYYO(D), SIGXYO(D), SXXOT(D), SYYOT(D), SCONTRL60
     4XYOT(D), AS1(C,D), AF(C,E), AS(C,E), AFT(D), AST(D), EXTRA(3), EXTCONTRL61
     5RA1(G,3), EXTRA2(G,3), EXTRA3(G), EXTRA4(G,3), EXTRA5(G,3), EXTRA6CONTRL62
     6(G,3), EXTRA7(G), EIB(H), CUB(H), DUM(G), EPSPS(G), SIBXXA(G), SIBCONTRL63
     7XXC(G), ESX(G,H), ASXLR(G), AILR(G), ZCRD(G), TSHEAR(G), ITYPE(G),CONTRL64
     8 DUMMY(1)                                                          CONTRL65
C                                                                         CONTRL66
C     THIS CONTROLS PROGRAM FLOW USING CODE IRS                           CONTRL67
C                                                                         CONTRL68
      GO TO (10,100,380,1150,1530,160,30), IRS                            CONTRL69
   10 CONTINUE                                                            CONTRL70
C                                                                         CONTRL71
C*************************************************************************CONTRL72
C                                                                         CONTRL73
C     READ INFORMATION AND INITIALIZE                                     CONTRL74
C                                                                         CONTRL75
C*************************************************************************CONTRL76
C                                                                         CONTRL77
      CALL READCN (NUMEL,NUMNP,LWIDTH,ISCALE,IDEAD,ICMPLT,PRECRK,PLTCRD,CONTRL78
     1ICARDS,ECARDS,CODEA,CODET,PRINTB,PRINTS,DGX,DGY,ETIME,NSIGNI,DSPMACONTRL79
     2X,TOLDSP,RDPR,RFPR,NTRIAL,NITER,LITER,LTRIAL,FCTT,PCTC,LCYCLE,RRATCONTRL80
     3IO,TOLF,QAPA,RQAPA,CQAPA,NITERD,INOTEN,OLOAD,PMAX,NCHECK,DPFC,NREACONTRL81
     4DB,KIN,KPS,KC,KMAT,FTOL,CTOL)                                       CONTRL82
C                                                                         CONTRL83
      WRITE (IO,20)                                                       CONTRL84
      WRITE (IO,20)                                                       CONTRL85
   20 FORMAT (1H0)                                                        CONTRL86
C                                                                         CONTRL87
      IOUT=3HNO                                                           CONTRL88
      ICON=3HNO                                                           CONTRL89
      ISTAGE=1                                                            CONTRL90
      ICHECK=-1                                                           CONTRL91
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      ITRIAL=0                                                          CONTRL92
      ITER=0                                                            CONTRL93
      QAPAC=1.0                                                         CONTPL94
      KSIG=0                                                            CONTRL95
      RDFPR=3HYES                                                       CONTPL96
      RDOLD=0.0                                                         CONTRL97
      RFOLD=0.0                                                         CONTRL98
      IFN=3H NO                                                         CONTPL99
      ITRALD=0                                                          CONTR100
      ITERD=0                                                           CONTR101
      HDISP=1.0                                                         CONTR102
      HFORCE=1.0                                                        CONTR103
      PFY=1.0                                                           CONTR104
      IF (PLTCRD.EQ.3HYES) REWIND 8                                     CONTR105
      IONE=3HNO                                                         CONTR106
      IF (LTRIAL.EQ.1.AND.LITER.EQ.1) IONE=3HYES                        CONTR107
C                                                                       CONTR108
C     INITIALIZE PLATE INFORMATION                                      CONTR109
C                                                                       CONTR110
      CALL INITIA (NUMEL,NCNS,NULAY,NA1,ETXX,SXXOT,AS1,AF,AS,AFT,DISPLA)CONTR111
C                                                                       CONTR112
C     INITIALIZE BEAM INFORMATION                                       CONTR113
C                                                                       CONTR114
      IF (NBEAMX.NE.0) CALL INITIB (NBEAMX,NULAYB,NNN,SIBXXA)           CONTR115
C                                                                       CONTR116
C                                                                       CONTR117
      IRS=2                                                             CONTR118
      RETURN                                                            CONTR119
C                                                                       CONTR120
C     READ IN PLATE INFORMATION                                         CONTR121
C                                                                       CONTR122
   30 CONTINUE                                                          CONTR123
      IF (ISRT.EQ.3HAVE) RETURN                                         CONTR124
C                                                                       CONTR125
C     DETERMINE WHICH NODE POINT OF THE ELEMENTS WILL BE                CONTR126
C     USED TO COMPUTE THE STRAINS AND STRESSES                          CONTR127
C     IF ISRCH = NO THEN THE CENTER OF THE ELEMENT WILL BE USED         CONTR128
C                                                                       CONTR129
C                                                                       CONTR130
      REWIND 30                                                         CONTR131
      READ (30) DISP                                                    CONTR132
C                                                                       CONTR133
      IF (ISRCH.EQ.3HYES) CALL FSTRAN (NUMEL,NA1,NANA,NULAY,CUXX,CUYY,CUCONTR134
     1XY,EIXX,EIYY,EIXY,DISP,PDT,PZC,SZC,AFT,AST,NSLAYR)                CONTR135
C                                                                       CONTR136
      WRITE (IO,40)                                                     CONTR137
   40 FORMAT (1H1,////)                                                 CONTR138
      WRITE (IO,50)                                                     CONTR139
   50 FORMAT (1H0,//,6X,*SLAB         NODE POINT AT WHICH ELEMENT*,//,6X,CONTR140
     1*ELEMENT     STRESSES ARE COMPUTED*,//,18X,*( 0 = CENTER OF ELEMENCONTR141
     2T)*,//)                                                           CONTR142
C                                                                       CONTR143
      REWIND 32                                                         CONTR144
      DO 60 I=1,NUMEL                                                   CONTR145
   60 READ (32) AFT,AST                                                 CONTR146
C                                                                       CONTR147
      DO 70 I=1,NUMEL                                                   CONTR148
      READ (32) J,M,N                                                   CONTR149
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   70 WRITE (IO,80) I,J                                                  CONTR150
   80 FORMAT (1H ,8X,I3,26X,I3)                                          CONTR151
C                                                                        CONTR152
      ISRCH=3HNO                                                         CONTR153
C                                                                        CONTR154
      DO 90 I=1,NA1                                                      CONTR155
   90 DISP(I)=0.                                                         CONTR156
C                                                                        CONTR157
      REWIND 30                                                          CONTR158
      WRITE (30) DISP                                                    CONTR159
C                                                                        CONTR160
      RETURN                                                             CONTR161
C                                                                        CONTR162
C                                                                        CONTR163
  100 CONTINUE                                                           CONTR164
C                                                                        CONTR165
C                                                                        CONTR166
C************************************************************************CONTR167
C     RESTART USING INITIAL START CARDS ON FILE STARTI                   CONTR168
C                                                                        CONTR169
C************************************************************************CONTR170
C                                                                        CONTR171
      IN=9                                                               CONTR172
      REWIND 19                                                          CONTR173
      REWIND 21                                                          CONTR174
      REWIND 32                                                          CONTR175
      REWIND IN                                                          CONTR176
      READ (IN) ICYCLE,ITRIAL,ITER,QAPAC,PFC,HDISP,HFORCE,PFY            CONTR177
      READ (IN) FVAL(1),FVAL(2),FVAL(3),FVAL(4),FVAL(5),FVAL(6)          CONTR178
C                                                                        CONTR179
      DO 110 I=1,NUMEL                                                   CONTR180
      READ (IN) SXXOT,SYYOT,SXYOT                                        CONTR181
      READ (IN) SIGXXO,SIGYYO,SIGXYO                                     CONTR182
      READ (IN) AFT,AST                                                  CONTR183
      WRITE (21) SXXOT,SYYOT,SXYOT                                       CONTR184
      WRITE (19) SIGXXO,SIGYYO,SIGXYO                                    CONTR185
      WRITE (32) AFT,AST                                                 CONTR186
  110 CONTINUE                                                           CONTR187
C                                                                        CONTR188
      DO 120 I=1,NUMEL                                                   CONTR189
      READ (IN) J,M,N                                                    CONTR190
  120 WRITE (32) J,M,N                                                   CONTR191
C                                                                        CONTR192
      READ (IN) FORCE,LILA                                               CONTR193
      READ (IN) DISPO,FORCEB,FCADD                                       CONTR194
      READ (IN) AS1,AF,AS                                                CONTR195
      READ (IN) FORCEA,DISPLA,FCSADD,ETXX,ETYY,ETXY,CTXX,CTYY,CTXY       CONTR196
C                                                                        CONTR197
      REWIND 17                                                          CONTR198
      WRITE (17) FORCEA,DISPLA,FCSADD,ETXX,ETYY,ETXY,CTXX,CTYY,CTXY      CONTR199
      REWIND 31                                                          CONTR200
      WRITE (31) AS1,AF,AS                                               CONTR201
      REWIND 18                                                          CONTR202
      WRITE (18) DISPO,FORCEB,FCADD                                      CONTR203
      REWIND 29                                                          CONTR204
      WRITE (29) FORCE,LILA                                              CONTR205
C                                                                        CONTR206
      IN=1                                                               CONTR207
```

```
C                                                                       CONTR208
      WRITE (IO,20)                                                     CONTR209
      WRITE (IO,20)                                                     CONTR210
      WRITE (IO,880) ICYCLE                                             CONTR211
      WRITE (IO,890) QAFAC,PFC                                          CONTR212
      WRITE (IO,20)                                                     CONTR213
C                                                                       CONTR214
      IOUTS=2                                                           CONTR215
      IF (NBEAMX.EQ.0) GO TO 140                                        CONTR216
      IN=9                                                              CONTR217
      REWIND 15                                                         CONTR218
      REWIND 23                                                         CONTR219
      REWIND 25                                                         CONTR220
      REWIND 33                                                         CONTR221
      DO 130 I=1,NBEAMX                                                 CONTR222
      READ (IN) SIBXXA                                                  CONTR223
      READ (IN) SIBXXC                                                  CONTR224
      READ (IN) EPSPS                                                   CONTR225
      WRITE (15) SIBXXA                                                 CONTR226
      WRITE (23) SIBXXC                                                 CONTR227
      WRITE (25) EPSPS                                                  CONTR228
  130 CONTINUE                                                          CONTR229
      READ (IN) ESX                                                     CONTR230
      WRITE (33) ESX                                                    CONTR231
      IN=1                                                              CONTR232
      IOUTS=3                                                           CONTR233
  140 CONTINUE                                                          CONTR234
      IRS=4                                                             CONTR235
      RETURN                                                            CONTR236
C                                                                       CONTR237
  150 CONTINUE                                                          CONTR238
C                                                                       CONTR239
C***********************************************************************CONTR240
C                                                                       CONTR241
C     DEAD LOAD SOLUTION FOR WHOLE STRUCTURE                            CONTR242
C                                                                       CONTR243
C***********************************************************************CONTR244
C                                                                       CONTR245
      IRS=6                                                             CONTR246
      IOUTS=1                                                           CONTR247
      IF (ITP.EQ.3HYES) ICUTS=3                                         CONTR248
C                                                                       CONTR249
C     SOLVE SYSTEM FOR DEAD LOAD SOLUTION                               CONTR250
C                                                                       CONTR251
      RETURN                                                            CONTR252
C                                                                       CONTR253
  160 CONTINUE                                                          CONTR254
      IF (ITERD.EQ.0.AND.ITRALD.EQ.0) WRITE (IO,40)                     CONTR255
      WRITE (IO,170)                                                    CONTR256
  170 FORMAT (/,1H0,4X,*DEAD LOAD SOLUTION*)                            CONTR257
      ITERD=ITERD+1                                                     CONTR258
      WRITE (IO,400) ITRALD                                             CONTR259
      WRITE (IO,410) ITERD                                              CONTR260
      REWIND 18                                                         CONTR261
      REWIND 30                                                         CONTR262
      REWIND 31                                                         CONTR263
      REWIND 33                                                         CONTR264
      READ (18) DISPO,FORCEB,FCADD                                      CONTR265
```

```
      READ (30) DISP                                                    CONTR266
      READ (31) AS1,AF,AS                                               CONTR267
      READ (33) ESX                                                     CONTR268
C                                                                       CONTR269
C     FIND SLAB STRAINS                                                 CONTR270
C                                                                       CONTR271
      CALL PSTRAN (NUMEL,NA1,NANA,NULAY,CUXX,CUYY,CUXY,EIXX,EIYY,EIXY,DICONTR272
     1SP,PDT,PZC,SZC,AFT,AST,NSLAYR)                                    CONTR273
C                                                                       CONTR274
C     FIND BEAM STRAINS                                                 CONTR275
C                                                                       CONTR276
      IF (NBEAMX.NE.0) CALL BSTRAN (NIX,NULAYB,NA1,NBEAMX,EIB,CUB,DUM,DICONTR277
     1SP)                                                               CONTR278
C                                                                       CONTR279
C     FIND SLAB STRESSES                                                CONTR280
C                                                                       CONTR281
      PF=1.0                                                            CONTR282
      CALL PSTRSS (ISTAGE,PF,NUMEL,NCNS,NULAY,NSLAYR,NSMAT,SIGXXO,SIGYYCONTR283
     1,SIGXYO,CUXX,CUYY,CUXY,EIXX,EIYY,EIXY,PZC,PDT,DT,SZC,SXXOT,SYYOT,SCONTR284
     2XYOT,AS1,AF,AS,SEMOD,SIGMAP,SPROM,SPRON,NSTYPE,SPHI)              CONTR285
C                                                                       CONTR286
C     FIND BEAM STRESSES                                                CONTR287
C                                                                       CONTR288
      IF (NBEAMX.NE.0) CALL BSTRSS (PF,DUM,ZCRD,EIB,CUB,KC,NULAYB,NBEAMXCONTR289
     1,KMAT,SIBXXA,SIBXXC,ESX,RON,ROM,SIGO,FT,RONT,ROMT,ITYPE)          CONTR290
C                                                                       CONTR291
C     CHECK CONVERGENCE                                                 CONTR292
C                                                                       CONTR293
      DO 180 II=1,NA1                                                   CONTR294
      I=II                                                              CONTR295
      A=DISPO(I)                                                        CONTR296
      B=DISP(I)                                                         CONTR297
      IF (ABS(B).LE.1.0E-09) GO TO 180                                  CONTR298
      IF (ABS((B-A)/B).GT.TOLDSP) GO TO 190                             CONTR299
  180 CONTINUE                                                          CONTR300
      ICON=3HYES                                                        CONTR301
      GO TO 200                                                         CONTR302
  190 CONTINUE                                                          CONTR303
      ICON=3HNO                                                         CONTR304
C                                                                       CONTR305
  200 DO 210 I=1,NA1                                                    CONTR306
  210 DISPO(I)=DISP(I)                                                  CONTR307
C                                                                       CONTR308
C                                                                       CONTR309
      IF (ITRALD.NE.0) GO TO 220                                        CONTR310
      IF (ITERD.NE.1) GO TO 220                                         CONTR311
C                                                                       CONTR312
C     FIRST TIME THROUGH READ THE DEAD LOAD FORCE VECTOR                CONTR313
C                                                                       CONTR314
      REWIND 29                                                         CONTR315
      READ (29) FORCE,LILA                                              CONTR316
      READ (29) FORCEB                                                  CONTR317
  220 CONTINUE                                                          CONTR318
      REWIND 18                                                         CONTR319
      WRITE (18) DISPO,FORCEB,FCADD                                     CONTR320
C                                                                       CONTR321
C     SET TRIAL AND ITERATION COUNTERS                                  CONTR322
C                                                                       CONTR323
```

```
      IF (ICON.EQ.3HYES.OR.ITERD.GE.NITERD) ITRALD=ITRALD+1                CONTR324
      IF (ICON.EQ.3HYES.OR.ITERD.GE.NITERD) ITERD=0                        CONTR325
C                                                                          CONTR326
      IF (ISCALE.NE.3HYES) GO TO 230                                       CONTR327
      IF (IFN.EQ.3HYES) GO TO 230                                          CONTR328
C                                                                          CONTR329
C     FIND SLAB SCALE FACTOR                                               CONTR330
C                                                                          CONTR331
      CALL PSCALE (RATIOP,IFN,ISCALE,SXXOT,SYYOT,SXYOT,PCTT,PCTC,IO,NCNSCONTR332
     1,NUMEL,NULAY,NSLAYR,NSMAT,SIGXXO,SIGYYO,SIGXYO,NSTYPE,SPHI,SIGMAP)CONTR333
C                                                                          CONTR334
C     FIND BEAM SCALE FACTOR                                               CONTR335
C                                                                          CONTR336
      IF (NBEAMX.NE.0) CALL BSCALE (RATIOB,IFN,ISCALE,KC,DUM,NBEAMX,NULACONTR337
     1YB,KMAT,PCTT,PCTC,SIBXXA,SIBXXC,ITYPE,SIGO,FT)                      CONTR338
  230 CONTINUE                                                             CONTR339
C                                                                          CONTR340
      PFC=1.0                                                              CONTR341
      IF (ITRALD.EQ.0) PFC=0.0                                             CONTR342
      IF (ITRALD.EQ.2) PFC=0.0                                             CONTR343
C                                                                          CONTR344
C     CHECK SLAB LAYER FAILURE                                             CONTR345
C                                                                          CONTR346
      REWIND 17                                                            CONTR347
      READ (17) FORCEA,DISPLA,FCSADD,ETXX,ETYY,ETXY,CTXX,CTYY,CTXY        CONTR348
      CALL PCHECK (IO,NA1,NUMEL,NCNS,NULAY,NSLAYR,NSMAT,NANA,PZC,PDT,SZCCONTR349
     1,SDT,DT,ELLA,ELLB,NPI,NPJ,NPK,NPL,FCADD,CTXX,CTYY,CTXY,CUXX,CUYY,CCONTR350
     2UXY,ETXX,ETYY,ETXY,EIXX,EIYY,EIXY,SXXOT,SYYOT,SXYOT,SIGXXO,SIGYYO,CONTR351
     3SIGXYO,AS1,AF,AS,AFT,AST,NSTYPE,SPHI,SIGMAP)                        CONTR352
C                                                                          CONTR353
C     CHECK BEAM LAYER FAILURE, MODULUS, UNLOADING                         CONTR354
C                                                                          CONTR355
      IF (NBEAMX.NE.0) CALL BCHECK (KC,NIX,NBEAMX,NULAYB,KMAT,NA1,IO,CUBCONTR356
     1,EIB,DUM,NPIX,NPKX,SIBXXC,SIBXXA,ITYPE,FT,SIGO,ESX,EDOWNT,EDOWN,DICONTR357
     2SP,DISPLA,ZCRD,XLNGTH,ASXLR,EPSPS,STRAN,FCADD,IOUT)                 CONTR358
C                                                                          CONTR359
      REWIND 33                                                            CONTR360
      WRITE (33) ESX                                                       CONTR361
C                                                                          CONTR362
      IF (ITRALD.EQ.2) PFC=1.0                                             CONTR363
      IF (PFC.NE.0.0) GO TO 240                                            CONTR364
      ITP=3HNO                                                             CONTR365
      GO TO 150                                                            CONTR366
  240 CONTINUE                                                             CONTR367
C                                                                          CONTR368
      ITP=3HYES                                                            CONTR369
C                                                                          CONTR370
      DO 250 I=1,NA1                                                       CONTR371
      FORCE(I)=0.0                                                         CONTR372
  250 FORCEA(I)=0.0                                                        CONTR373
C                                                                          CONTR374
C     ACCUMULATE FIELD QUANTITIES AT END OF DEAD LOAD SOLUTION             CONTR375
C                                                                          CONTR376
      CALL ACCUMU (NUMEL,NA1,NBEAMX,NULAYB,NCNS,NULAY,CTXX,CTYY,CTXY,CUXCONTR377
     1X,CUYY,CUXY,ETXX,ETYY,ETXY,EIXX,EIYY,EIXY,SXXOT,SYYOT,SXYOT,SIGXXCONTR378
     2,SIGYYO,SIGXYO,DISPLA,DISP,FORCE,FORCEA,ESX,ITYPE,ZCRD,DUM,EPSPS,ACONTR379
     3S1,AFT,AST,SIBXXC,SIBXXA,AF,AS)                                     CONTR380
C                                                                          CONTR381
```

```
      REWIND 17                                                          CONTR382
      WRITE (17) FORCEA,DISPLA,FORCEA,ETXX,ETYY,ETXY,CTXX,CTYY,CTXY      CONTR383
      IF (ITRALD.EQ.2) GO TO 260                                         CONTR384
C                                                                        CONTR385
C     WRITE FICTITIOUS FORCE VECTOR TO TAPE                              CONTR386
C                                                                        CONTR387
      REWIND 29                                                          CONTR388
      READ (29) FORCE,LILA                                               CONTR389
      REWIND 29                                                          CONTR390
      WRITE (29) FORCE,LILA                                              CONTR391
      WRITE (29) FCADD                                                   CONTR392
  260 CONTINUE                                                           CONTR393
C                                                                        CONTR394
C     FIND BEAM STRAINS                                                  CONTR395
C                                                                        CONTR396
      IF (NBEAMX.EQ.0) GO TO 300                                         CONTR397
      REWIND 5                                                           CONTR398
      REWIND 25                                                          CONTR399
      REWIND 27                                                          CONTR400
      DO 280 I=1,NBEAMX                                                  CONTR401
      READ (27) A,A,A,A,SIBXXA,SIBXXA,SIBXXA,SIBXXA,SIBXXC              CONTR402
      READ (25) SIBXXC                                                   CONTR403
      DO 270 J=1,NULAYB                                                  CONTR404
      SIBXXC(J)=SIBXXC(J)+EIB(I)+CUB(I)*SIBXXA(J)                        CONTR405
  270 CONTINUE                                                           CONTR406
      WRITE (5) SIBXXC                                                   CONTR407
  280 CONTINUE                                                           CONTR408
      REWIND 5                                                           CONTR409
      REWIND 25                                                          CONTR410
      DO 290 I=1,NBEAMX                                                  CONTR411
      READ (5) SIBXXC                                                    CONTR412
      WRITE (25) SIBXXC                                                  CONTR413
  290 CONTINUE                                                           CONTR414
  300 CONTINUE                                                           CONTR415
C                                                                        CONTR416
C     IF ITRALD = 1 THEN ITERATE SO AS TO REDISTRIBUTE FICTITIOUS FORCESCONTR417
C     IF ITRALD = 2 THEN FINISH DEAD LOAD SOLUTION                       CONTR418
C                                                                        CONTR419
      IF (ITRALD.EQ.2) GO TO 310                                         CONTR420
      GO TO 150                                                          CONTR421
  310 CONTINUE                                                           CONTR422
C                                                                        CONTR423
C     ENDING DEAD LOAD SOLUTION                                          CONTR424
C                                                                        CONTR425
      IDEAD=3HNO                                                         CONTR426
      REWIND 17                                                          CONTR427
      REWIND 18                                                          CONTR428
      READ (17) FORCEA,DISPLA,FORCEA,ETXX,ETYY,ETXY,CTXX,CTYY,CTXY      CONTR429
      READ (18) DISPO,FORCEB,FCADD                                       CONTR430
      DO 320 I=1,NA1                                                     CONTR431
  320 FORCEA(I)=FORCEB(I)                                                CONTR432
      WRITE (IO,330)                                                     CONTR433
  330 FORMAT (//,1H0,10X,*SOLUTION FOR DEAD LOAD ON THE STRUCTURE*,//)   CONTR434
      PFC=PLTCRD                                                         CONTR435
      PLTCRD=3HNO                                                        CONTR436
C                                                                        CONTR437
C     PRINT FORCE AND DISPLACEMENT VECTORS                               CONTR438
C                                                                        CONTR439
```

```
      CALL QPRINT (HDISP,HFORCE,RDISP,RFORCE,RDFPR,NSLAYR,NULAY,NCNS,NUMCONTR440
     1EL,AFT,AST,AS1,NA1,NUMNP,IO,FORCEA,DISPLA)                       CONTR441
      PLTCRD=PFC                                                        CONTR442
C                                                                       CONTR443
C     FIND SLAB INTERNAL FORCES                                         CONTR444
C                                                                       CONTR445
      CALL PFORCE (IO,NUMEL,NCNS,NULAY,NSLAYR,RDFPR,21,PZC,PDT,DT,SDT,SZCONTR446
     1C,SXXOT,SYYOT,SXYCT)                                             CONTR447
C                                                                       CONTR448
C     FIND BEAM INTERNAL FORCES                                         CONTR449
C                                                                       CONTR450
      IF (NBEAMX.NE.0) CALL BFORCE (NULAYB,NBEAMX,IO,DUM,RDFPR,15,ASXLR,CONTR451
     1SIBXXA,ZCRD)                                                     CONTR452
C                                                                       CONTR453
C     PRINT SLAB STRESSES                                               CONTR454
C                                                                       CONTR455
      WRITE (IO,1390)                                                   CONTR456
      WRITE (IO,470)                                                    CONTR457
      CALL PRISTR (SXXOT,SYYOT,SXYOT,1.0,21,NULAY,NUMEL,NCNS,NSLAYR,SPHICONTR458
     1,IO)                                                             CONTR459
C                                                                       CONTR460
      WRITE (IO,1400)                                                   CONTR461
      WRITE (IO,480)                                                    CONTR462
C                                                                       CONTR463
C     PRINT BEAM STRESSES                                               CONTR464
C                                                                       CONTR465
      IF (NBEAMX.NE.0) CALL PRISRB (SIBXXA,15,NULAYB,NBEAMX,IO)         CONTR466
C                                                                       CONTR467
C     PRINT FICTITIOUS FORCES                                           CONTR468
C                                                                       CONTR469
      IF (CODEA.NE.3HYES) GO TO 350                                     CONTR470
      REWIND 29                                                         CONTR471
      READ (29) FORCE,LILA                                              CONTR472
      READ (29) FCADD                                                   CONTR473
      WRITE (IO,340)                                                    CONTR474
  340 FORMAT (1H0,10X,*LEFT OVER FICTITIOUS FORCES*,//)                 CONTR475
      WRITE (IO,1510)                                                   CONTR476
      WRITE (IO,440) (M,FCADD(5*M-4),FCADD(5*M-3),FCADD(5*M-2),FCADD(5*MCONTR477
     1-1),FCADD(5*M),M=1,NUMNP)                                        CONTR478
  350 CONTINUE                                                          CONTR479
C                                                                       CONTR480
      DO 360 I=1,NA1                                                    CONTR481
  360 FORCEA(I)=0.                                                      CONTR482
      REWIND 17                                                         CONTR483
      REWIND 18                                                         CONTR484
      REWIND 30                                                         CONTR485
      WRITE (17) FORCEA,FORCEA,FORCEA,ETXX,ETYY,ETXY,CTXX,CTYY,CTXY     CONTR486
      WRITE (18) FORCEA,FORCEA,FORCEA                                   CONTR487
      WRITE (30) FORCEA                                                 CONTR488
      IF (ISCALE.NE.3HYES) GO TO 380                                    CONTR489
      IOUTS=3                                                           CONTR490
      IRS=3                                                             CONTR491
      RETURN                                                            CONTR492
C                                                                       CONTR493
C     SOLVE EQUATIONS                                                   CONTR494
C                                                                       CONTR495
  370 CONTINUE                                                          CONTR496
C                                                                       CONTR497
```

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C*************************************************************************CONTR498
C                                                                         CONTR499
C     SCALE UP THE INITIAL SOLUTION TO WITHIN THE PCTT OR PCTC LIMITS     CONTR500
C                                                                         CONTR501
C*************************************************************************CONTR502
C                                                                         CONTR503
      IOUTS=1                                                             CONTR504
      IRS=3                                                               CONTR505
      RETURN                                                              CONTR506
C                                                                         CONTR507
C     SOLVE SYSTEM                                                        CONTR508
C                                                                         CONTR509
  380 CONTINUE                                                            CONTR510
C                                                                         CONTR511
C     READ DATA FROM TAPES                                                CONTR512
C                                                                         CONTR513
      REWIND 29                                                           CONTR514
      READ (29) FORCE,LILA                                                CONTR515
      REWIND 18                                                           CONTR516
      READ (18) DISPO,FORCEB,FCADD                                        CONTR517
      REWIND 30                                                           CONTR518
      READ (30) DISP                                                      CONTR519
      REWIND 31                                                           CONTR520
      REWIND 33                                                           CONTR521
      READ (31) AS1,AF,AS                                                 CONTR522
C                                                                         CONTR523
      READ (33) ESX                                                       CONTR524
C                                                                         CONTR525
C     FIND SLAB STRAINS                                                   CONTR526
C                                                                         CONTR527
      CALL PSTRAN (NUMEL,NA1,NANA,NULAY,CUXX,CUYY,CUXY,EIXX,EIYY,EIXY,DICONTR528
     1SP,PDT,PZC,SZC,AFT,AST,NSLAYR)                                      CONTR529
C                                                                         CONTR530
C     FIND BEAM STRAINS                                                   CONTR531
C                                                                         CONTR532
      IF (NBEAMX.NE.0) CALL BSTRAN (NIX,NULAYB,NA1,NBEAMX,EIB,CUB,DUM,DICONTR533
     1SP)                                                                 CONTR534
      IF (ISCALE.NE.3HYES) GO TO 840                                      CONTR535
C                                                                         CONTR536
C     ROUTINES FOR CONVERGENCE AND NO CONVERGENCE                         CONTR537
C                                                                         CONTR538
      ITER=ITER+1                                                         CONTR539
      PF=1.0                                                              CONTR540
C                                                                         CONTR541
C     FIND SLAB STRESSES                                                  CONTR542
C                                                                         CONTR543
      CALL PSTRSS (ISTAGE,PF,NUMEL,NCNS,NULAY,NSLAYR,NSMAT,SIGXXO,SIGYYCONTR544
     1,SIGXYO,CUXX,CUYY,CUXY,EIXX,EIYY,EIXY,PZC,PDT,DT,SZC,SXXOT,SYYOT,SCONTR545
     2XYOT,AS1,AF,AS,SEMOD,SIGMAP,SPROM,SPRON,NSTYPE,SPHI)                CONTR546
C                                                                         CONTR547
C     FIND BEAM STRESSES                                                  CONTR548
C                                                                         CONTR549
      IF (NBEAMX.NE.0) CALL BSTRSS (PF,DUM,ZCRD,EIB,CUB,KC,NULAYB,NBEAMXCONTR550
     1,KMAT,SIBXXA,SIBXXC,ESX,RON,ROM,SIGO,FT,RONT,ROMT,ITYPE)            CONTR551
C                                                                         CONTR552
      IF (ITRIAL.EQ.0.AND.ITER.EQ.1) WRITE (IO,40)                        CONTR553
      WRITE (IO,390)                                                      CONTR554
  390 FORMAT (/,1H0,4X,*SCALING PROCEDURE*)                               CONTR555
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      WRITE (IO,400) ITRIAL                                              CONTR556
  400 FORMAT (/,1H ,5X,*NUMBER OF TRIALS     = *,I5)                     CONTR557
      WRITE (IO,410) ITER                                                CONTR558
  410 FORMAT (/,1H ,5X,*NUMBER OF ITERATIONS = *,I5)                     CONTR559
C                                                                        CONTR560
      IF (CODEA.NE.3HYES) GO TO 490                                      CONTR561
C                                                                        CONTR562
      WRITE (IO,420)                                                     CONTR563
  420 FORMAT (/5X,*DISPLACEMENT INCREMENT*,/)                            CONTR564
      WRITE (IO,430)                                                     CONTR565
  430 FORMAT (1H0,5X,*NODAL POINTS*,8X,*U-DISP*,11X,*V-DISP*,12X,*W-DISPCONTR566
     1*,12X,*MX-DISP*,11X,*MY-DISP*,//)                                  CONTR567
      WRITE (IO,440) (M,DISP(5*M-4),DISP(5*M-3),DISP(5*M-2),DISP(5*M-1),CONTR568
     1DISP(5*M),M=1,NUMNP)                                               CONTR569
  440 FORMAT (6X,I5,2X,5F18.5)                                           CONTR570
C                                                                        CONTR571
      WRITE (IO,450)                                                     CONTR572
  450 FORMAT (///9X,*NODAL POINT FORCE INCREMENT INCLUDING FICTIOUS FOR CONTR573
     1 CES*,/1X)                                                         CONTR574
      WRITE (IO,1510)                                                    CONTR575
      WRITE (IO,440) (M,FORCE(5*M-4),FORCE(5*M-3),FORCE(5*M-2),FORCE(5*MCONTR576
     1-1),FORCE(5*M),M=1,NUMNP)                                          CONTR577
      WRITE (IO,20)                                                      CONTR578
C                                                                        CONTR579
C                                                                        CONTR580
      WRITE (IO,460)                                                     CONTR581
  460 FORMAT (/5X,*STRESS INCREMENT*,/)                                  CONTR582
      WRITE (IO,470)                                                     CONTR583
  470 FORMAT (/,1H0,4X,*EL LAYER*,6X,*SXX*,11X,*SYY*,11X,*SXY*,10X,2HS1,CONTR584
     112X,2HS2,10X,6HTHETA1)                                             CONTR585
C                                                                        CONTR586
      CALL PRISTR (SIGXXO,SIGYYO,SIGXYO,1.0,19,NULAY,NUMEL,NGNS,NSLAYR,SCONTR587
     1PHI,IO)                                                            CONTR588
C                                                                        CONTR589
      WRITE (IO,460)                                                     CONTR590
      WRITE (IO,480)                                                     CONTR591
  480 FORMAT (1H )                                                       CONTR592
C                                                                        CONTR593
      IF (NBEAMX.NE.0) CALL PRISRB (SIBXXC,23,NULAYB,NBEAMX,IO)          CONTR594
C                                                                        CONTR595
C                                                                        CONTR596
  490 CONTINUE                                                           CONTR597
      IF (IFN.EQ.3HYES) GO TO 840                                        CONTR598
C                                                                        CONTR599
C     CHECK FOR CONVERGENCE OF FIRST TRIAL LOAD                          CONTR600
C                                                                        CONTR601
      DO 500 II=1,NA1                                                    CONTR602
      I=II                                                               CONTR603
      A=DISPO(I)                                                         CONTR604
      B=DISP(I)                                                          CONTR605
      IF (ABS(B).LE.1.0E-09) GO TO 500                                   CONTR606
      IF (ABS((B-A)/B).GT.TOLDSP) GO TO 510                              CONTR607
  500 CONTINUE                                                           CONTR608
      ICON=3HYES                                                         CONTR609
      GO TO 530                                                          CONTR610
  510 CONTINUE                                                           CONTR611
C                                                                        CONTR612
C     ROUTINE FOR NO CONVERGENCE                                         CONTR613
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C                                                                       CONTR614
      ICON=3HNO                                                         CONTR615
      DO 520 I=1,NA1                                                    CONTR616
  520 DISPO(I)=DISP(I)                                                  CONTR617
      REWIND 18                                                         CONTR618
      WRITE (18) DISPO,FORCEB,FCADD                                     CONTR619
C                                                                       CONTR620
  530 CONTINUE                                                          CONTR621
C                                                                       CONTR622
C     TEST FOR MAXIMUN NUMBER OF ITERATIONS                             CONTR623
C                                                                       CONTR624
      IF (ITER.NE.1) GO TO 540                                          CONTR625
      IF (ITRIAL.NE.0) GO TO 540                                        CONTR626
C                                                                       CONTR627
C     FIND IF PCTT OR PCTC LIMITS ARE EXCEEDED                          CONTR628
C                                                                       CONTR629
C     FOR SLAB                                                          CONTR630
C                                                                       CONTR631
      CALL PSCALE (RATIOP,IFN,ISCALE,SXXOT,SYYOT,SXYOT,PCTT,PCTC,IO,NCNSCONTR632
     1,NUMEL,NULAY,NSLAYR,NSMAT,SIGXXO,SIGYYO,SIGXYO,NSTYPE,SPHI,SIGMAP)CONTR633
      IF (IFN.EQ.3HYES) GO TO 840                                       CONTR634
C                                                                       CONTR635
C     FOR BEAM                                                          CONTR636
C                                                                       CONTR637
      IF (NBEAMX.NE.0) CALL BSCALE (RATIOB,IFN,ISCALE,KC,DUM,NBEAMX,NULACONTR638
     1YB,KMAT,PCTT,PCTC,SIBXXA,SIBXXC,ITYPE,SIGO,FT)                   CONTR639
      IF (IFN.EQ.3HYES) GO TO 840                                       CONTR640
  540 CONTINUE                                                          CONTR641
C                                                                       CONTR642
C     CHECK ITERATIONS, CONVERGENCE, AND TRIALS                         CONTR643
C                                                                       CONTR644
      IF (ITER.GT.NITER) GO TO 640                                      CONTR645
C                                                                       CONTR646
C     TEST FOR CONVERGENCE                                              CONTR647
C                                                                       CONTR648
      IF (ICON.EQ.3HNO ) GO TO 370                                      CONTR649
C                                                                       CONTR650
C     DID IT CONVERGE BEFORE OR AFTER SCALING                           CONTR651
C                                                                       CONTR652
      IF (ITRIAL.NE.0) GO TO 710                                        CONTR653
C                                                                       CONTR654
C     CONVERGENCE BEFORE SCALING                                        CONTR655
C                                                                       CONTR656
  550 CONTINUE                                                          CONTR657
      ITER=0                                                            CONTR658
C                                                                       CONTR659
C     FIND SLAB SCALE FACTOR                                            CONTR660
C                                                                       CONTR661
      CALL PSCALE (RATIOP,IFN,ISCALE,SXXOT,SYYOT,SXYOT,PCTT,PCTC,IO,NCNSCONTR662
     1,NUMEL,NULAY,NSLAYR,NSMAT,SIGXXO,SIGYYO,SIGXYO,NSTYPE,SPHI,SIGMAP)CONTR663
      IF (IFN.EQ.3HYES) GO TO 840                                       CONTR664
C                                                                       CONTR665
C     FIND BEAM SCALE FACTOR                                            CONTR666
C                                                                       CONTR667
      IF (NBEAMX.EQ.0) GO TO 560                                        CONTR668
C                                                                       CONTR669
      CALL BSCALE (RATIOB,IFN,ISCALE,KC,DUM,NBEAMX,NULAYB,KMAT,PCTT,PCTCCONTR670
     1,SIBXXA,SIBXXC,ITYPE,SIGO,FT)                                     CONTR671
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```
      IF (IFN.EQ.3HYES) GO TO 840                                       CONTR672
C                                                                       CONTR673
      IF (RATIO3.GT.RATIOP) RATIOP=RATIOB                               CONTR674
C                                                                       CONTR675
C     RATIOY IS YIELD RATIO                                             CONTR676
C     RATIOP IS CURRENT LOAD RATIO                                      CONTR677
C                                                                       CONTR678
  560 CONTINUE                                                          CONTR679
      IF (RATIOP.GT.1.0.OR.RATIOP.EQ.0.0) GO TO 1600                    CONTR680
      RATIOP=1.0/RATIOP                                                 CONTR681
      RATIOY=RATIOP                                                     CONTR682
      WRITE (IO,570) RATIOY                                             CONTR683
  570 FORMAT (/,1H ,5X,*INITIAL SCALING RATIO = *,E11.4)                CONTR684
C                                                                       CONTR685
C     SCALE TO YIELD                                                    CONTR686
C                                                                       CONTR687
      DO 580 I=1,NA1                                                    CONTR688
      DISPO(I)=DISP(I)*RATIOP                                           CONTR689
      FORCE(I)=FORCE(I)*RATIOP                                          CONTR690
  580 FORCEB(I)=FORCE(I)                                                CONTR691
      REWIND 29                                                         CONTR692
      WRITE (29) FORCE,LILA                                             CONTR693
      REWIND 18                                                         CONTR694
      WRITE (18) DISPO,FORCEB,FCADD                                     CONTR695
C                                                                       CONTR696
      REWIND 5                                                          CONTR697
      REWIND 19                                                         CONTR698
      DO 600 N=1,NUMEL                                                  CONTR699
      READ (19) SIGXXO,SIGYYO,SIGXYO                                    CONTR700
      DO 590 ML=1,NCNS                                                  CONTR701
      SIGXXO(ML)=SIGXXO(ML)*RATIOP                                      CONTR702
      SIGYYO(ML)=SIGYYO(ML)*RATIOP                                      CONTR703
      SIGXYO(ML)=SIGXYO(ML)*RATIOP                                      CONTR704
  590 CONTINUE                                                          CONTR705
      WRITE (5) SIGXXO,SIGYYO,SIGXYO                                    CONTR706
  600 CONTINUE                                                          CONTR707
      REWIND 5                                                          CONTR708
      REWIND 19                                                         CONTR709
      CALL FTNCOPY (4LJUM5,3LJ19,0)                                     CONTR710
C                                                                       CONTR711
      IF (NBEAMX.EQ.0) GO TO 630                                        CONTR712
      REWIND 5                                                          CONTR713
      REWIND 23                                                         CONTR714
      DO 620 N=1,NBEAMX                                                 CONTR715
      READ (23) SIBXXC                                                  CONTR716
      DO 610 ML=1,NULAYB                                                CONTR717
      SIBXXC(ML)=SIBXXC(ML)*RATIOP                                      CONTR718
  610 CONTINUE                                                          CONTR719
      WRITE (5) SIBXXC                                                  CONTR720
  620 CONTINUE                                                          CONTR721
      REWIND 5                                                          CONTR722
      REWIND 23                                                         CONTR723
      CALL FTNCOPY (4LJUM5,3LJ23,0)                                     CONTR724
C                                                                       CONTR725
  630 CONTINUE                                                          CONTR726
C                                                                       CONTR727
C     DO FOR FIRST TRIAL                                                CONTR728
C                                                                       CONTR729
```

```
      AA=1.0                                                          CONTR730
      ITRIAL=ITRIAL+1                                                 CONTR731
      GO TO 370                                                       CONTR732
  640 CONTINUE                                                        CONTR733
C                                                                     CONTR734
C     NO CONVERGENCE                                                  CONTR735
C     CHECK IF FIRST TRIAL                                            CONTR736
C                                                                     CONTR737
      IF (ITRIAL.EQ.0) GO TO 550                                      CONTR738
C                                                                     CONTR739
C     SCALE DOWN AND TRY AGAIN TO GET CONVERGENCE                     CONTR740
C                                                                     CONTR741
      ITRIAL=ITRIAL+1                                                 CONTR742
      IF (ITRIAL.GT.NTRIAL) GO TO 710                                 CONTR743
      AA=AA*RRATIO                                                    CONTR744
      DO 650 I=1,NA1                                                  CONTR745
      FORCE(I)=FORCEB(I)*AA                                           CONTR746
      DISPO(I)=DISP(I)*RRATIO                                         CONTR747
  650 CONTINUE                                                        CONTR748
      REWIND 18                                                       CONTR749
      WRITE (18) DISPO,FORCEB,FCADD                                   CONTR750
      REWIND 29                                                       CONTR751
      WRITE (29) FORCE,LILA                                           CONTR752
C                                                                     CONTR753
      REWIND 5                                                        CONTR754
      REWIND 19                                                       CONTR755
      DO 670 N=1,NUMEL                                                CONTR756
      READ (19) SIGXXO,SIGYYO,SIGXYO                                  CONTR757
      DO 660 ML=1,NCNS                                                CONTR758
      SIGXXO(ML)=SIGXXO(ML)*RRATIO                                    CONTR759
      SIGYYO(ML)=SIGYYO(ML)*RRATIO                                    CONTR760
      SIGXYO(ML)=SIGXYO(ML)*RRATIO                                    CONTR761
  660 CONTINUE                                                        CONTR762
      WRITE (5) SIGXXO,SIGYYO,SIGXYO                                  CONTR763
  670 CONTINUE                                                        CONTR764
      REWIND 5                                                        CONTR765
      REWIND 19                                                       CONTR766
      CALL FTNCOPY (4LJUMS,3LJ19,0)                                   CONTR767
C                                                                     CONTR768
      IF (NBEAMX.EQ.0) GO TO 700                                      CONTR769
      REWIND 5                                                        CONTR770
      REWIND 23                                                       CONTR771
      DO 690 N=1,NBEAMX                                               CONTR772
      READ (23) SIBXXC                                                CONTR773
      DO 680 ML=1,NULAYB                                              CONTR774
      SIBXXC(ML)=SIBXXC(ML)*RRATIO                                    CONTR775
  680 CONTINUE                                                        CONTR776
      WRITE (5) SIBXXC                                                CONTR777
  690 CONTINUE                                                        CONTR778
      REWIND 5                                                        CONTR779
      REWIND 23                                                       CONTR780
      CALL FTNCOPY (4LJUMS,3LJ23,0)                                   CONTR781
C                                                                     CONTR782
  700 CONTINUE                                                        CONTR783
      RATIOP=AA*RATIOY                                                CONTR784
      ITER=0                                                          CONTR785
      GO TO 370                                                       CONTR786
  710 CONTINUE                                                        CONTR787
```

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C                                                                       CONTR788
C     CONVERGENCE AFTER SCALING                                         CONTR789
C                                                                       CONTR790
C     GET FORCE VECTOR                                                  CONTR791
C                                                                       CONTR792
      DO 720 I=1,NA1                                                    CONTR793
  720 FORCE(I)=FORCEB(I)*AA                                             CONTR794
C                                                                       CONTR795
C*********************************************************************CONTR796
C                                                                       CONTR797
C     OBTAIN FORCE VECTOR FOR USE IN INCREMENTAL SOLUTION SCHEME        CONTR798
C                                                                       CONTR799
C*********************************************************************CONTR800
C                                                                       CONTR801
  730 CONTINUE                                                          CONTR802
C                                                                       CONTR803
      ICYCLE=0                                                          CONTR804
      PFC=1.0                                                           CONTR805
C                                                                       CONTR806
C     GET SCALE FACTOR                                                  CONTR807
C                                                                       CONTR808
      IFN=3HYES                                                         CONTR809
C                                                                       CONTR810
      CALL PSCALE (RATIOP,IFN,ISCALE,SXXOT,SYYOT,SXYOT,PCTT,PCTC,IO,NCNSCONTR811
     1,NUMEL,NULAY,NSLAYR,NSMAT,SIGXXO,SIGYYO,SIGXYO,NSTYPE,SPHI,SIGMAP)CONTR812
      IF (NBEAMX.EQ.0) GO TO 740                                        CONTR813
C                                                                       CONTR814
      CALL BSCALE (RATIOB,IFN,ISCALE,KC,DUM,NBEAMX,NULAYB,KMAT,PCTT,PCTCCONTR815
     1,SIBXXA,SIBXXC,ITYPE,SIGO,FT)                                     CONTR816
      IF (RATIOB.GT.RATIOP) RATIOP=RATIOB                               CONTR817
C                                                                       CONTR818
  740 CONTINUE                                                          CONTR819
      WRITE (IO,750)                                                    CONTR820
  750 FORMAT (/,1H0,4X,*FIND THE FORCE INCREMENT*)                      CONTR821
      RATIOP=1.0/RATIOP                                                 CONTR822
C                                                                       CONTR823
C     GET REFERENCE FORCE AND DISPLACEMENT                              CONTR824
C                                                                       CONTR825
      LL=NSIGNI(2)                                                      CONTR826
      HDISP=DISP(LL)*RATIOP                                             CONTR827
      LL=NSIGNI(1)                                                      CONTR828
      HFORCE=FORCE(LL)*RATIOP                                           CONTR829
      IF (ABS(HFORCE).LE.1.0E-06) HFORCE=1.                             CONTR830
      IF (ABS(HDISP).LE.1.0E-06) HDISP=1.                               CONTR831
      J=NSIGNI(2)                                                       CONTR832
      II=(J-1)/5+1                                                      CONTR833
      ML=J-((J-1)/5)*5                                                  CONTR834
      J=NSIGNI(1)                                                       CONTR835
      N=(J-1)/5+1                                                       CONTR836
      M=J-((J-1)/5)*5                                                   CONTR837
      IF (ML.EQ.1) ML=3H  U                                             CONTR838
      IF (ML.EQ.2) ML=3H  V                                             CONTR839
      IF (ML.EQ.3) ML=3H  W                                             CONTR840
      IF (ML.EQ.4) ML=3H MX                                             CONTR841
      IF (ML.EQ.5) ML=3H MY                                             CONTR842
      IF (M.EQ.1) M=3H  U                                               CONTR843
      IF (M.EQ.2) M=3H  V                                               CONTR844
      IF (M.EQ.3) M=3H  W                                               CONTR845
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      IF (M.EQ.4) M=3H MX                                                CONTR846
      IF (M.EQ.5) M=3H MY                                                CONTR847
      WRITE (IO,760) HDISP,II,ML,HFORCE,N,M                              CONTR848
  760 FORMAT (/,1H ,5X,*REFERENCE DISPLACEMENT = *,E12.5,* NODE= *,I3,A3CONTR849
     1,*DISP*,/,1H ,5X,*REFERENCE FORCE        = *,E12.5,* NODE= *,I3,A3CONTR850
     2,*FORCE*)                                                          CONTR851
C                                                                        CONTR852
C                                                                        CONTR853
C     SET FORCE INCREMENT                                                CONTR854
C                                                                        CONTR855
      DO 770 I=1,NA1                                                     CONTR856
  770 FORCEB(I)=FORCE(I)*RATIOP                                          CONTR857
      REWIND 18                                                          CONTR858
      WRITE (18) DISPO,FORCEB,FCADD                                      CONTR859
C                                                                        CONTR860
      IF (AA.NE.3HYES) GO TO 1310                                        CONTR861
C                                                                        CONTR862
C                                                                        CONTR863
C     SET INCREMENTS EQUAL TO ZERO                                       CONTR864
C                                                                        CONTR865
      DO 780 I=1,NA1                                                     CONTR866
      DISP(I)=0.0                                                        CONTR867
  780 FORCE(I)=0.0                                                       CONTR868
C                                                                        CONTR869
      REWIND 19                                                          CONTR870
      DO 790 ML=1,NCNS                                                   CONTR871
  790 SIGXXO(ML)=0.0                                                     CONTR872
      DO 800 N=1,NUMEL                                                   CONTR873
      EIXX(N)=0.0                                                        CONTR874
      EIYY(N)=0.0                                                        CONTR875
      EIXY(N)=0.0                                                        CONTR876
      CUXX(N)=0.0                                                        CONTR877
      CUYY(N)=0.0                                                        CONTR878
      CUXY(N)=0.0                                                        CONTR879
      WRITE (19) SIGXXO,SIGXXO,SIGXXO                                    CONTR880
  800 CONTINUE                                                           CONTR881
C                                                                        CONTR882
      IF (NBEAMX.EQ.0) GO TO 830                                         CONTR883
      REWIND 23                                                          CONTR884
      DO 810 ML=1,NULAYB                                                 CONTR885
  810 SIBXXC(ML)=0.0                                                     CONTR886
      DO 820 N=1,NBEAMX                                                  CONTR887
      EIB(N)=0.0                                                         CONTR888
      CUB(N)=0.0                                                         CONTR889
      WRITE (23) SIBXXC                                                  CONTR890
  820 CONTINUE                                                           CONTR891
  830 CONTINUE                                                           CONTR892
C                                                                        CONTR893
      GO TO 1310                                                         CONTR894
C                                                                        CONTR895
C     DO IF NO SCALING OR HAVE TERMINATED SCALING PREMATURELY            CONTR896
C                                                                        CONTR897
  840 AA=3HYES                                                           CONTR898
      IF (ISCALE.EQ.3HYES) GO TO 730                                     CONTR899
      AA=1.0                                                             CONTR900
      PFC=1.0                                                            CONTR901
      ICYCLE=0                                                           CONTR902
      DO 850 I=1,NA1                                                     CONTR903
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      FORCEB(I)=FORCE(I)                                                CONTR904
      FORCE(I)=0.0                                                      CONTR905
  850 CONTINUE                                                          CONTR906
      REWIND 18                                                         CONTR907
      WRITE (18) DISPO,FORCEB,FCADD                                     CONTR908
      GO TO 1310                                                        CONTR909
C                                                                       CONTR910
C                                                                       CONTR911
C*********************************************************************CONTR912
C     INCREMENTAL SOLUTION SCHEME UP TO FAILURE                         CONTR913
C                                                                       CONTR914
C*********************************************************************CONTR915
C                                                                       CONTR916
  860 CONTINUE                                                          CONTR917
C                                                                       CONTR918
C     START ITERATION LOOP                                              CONTR919
C                                                                       CONTR920
C     START OF NEW CYCLE                                                CONTR921
C     INITIALIZE                                                        CONTR922
C                                                                       CONTR923
      QAPAC=QAPA                                                        CONTR924
      PFC=1.0                                                           CONTR925
      ITER=0                                                            CONTR926
      ITRIAL=1                                                          CONTR927
      IF (LITER.NE.1.OR.LTRIAL.NE.1) IONE=3HNO                          CONTR928
      IF (ICHECK.EQ.NCHECK) QAPAC=QAPAC*RQAPA                           CONTR929
      IF (ICHECK.EQ.NCHECK) IONE=3HYES                                  CONTR930
C                                                                       CONTR931
C     SET FORCE INCREMENT                                               CONTR932
C                                                                       CONTR933
      DO 870 I=1,NA1                                                    CONTR934
      FORCE(I)=FORCEB(I)*QAPAC+FCADD(I)                                 CONTR935
  870 CONTINUE                                                          CONTR936
C                                                                       CONTR937
C     INCREASE CYCLE NUMBER                                             CONTR938
C                                                                       CONTR939
      ICYCLE=ICYCLE+1                                                   CONTR940
      IF (ICYCLE.EQ.1) RDFPR=3HYES                                      CONTR941
C                                                                       CONTR942
      WRITE (IO,880) ICYCLE                                             CONTR943
  880 FORMAT (//,1H ,5X,*LOAD CYCLE = *,I8)                             CONTR944
      WRITE (IO,890) QAPAC,PFC                                          CONTR945
  890 FORMAT (/,1H ,5X,*----LOAD RATIO AT START OF CYCLE     = *,E16.9,/CONTR946
     1,6X,*----PRESCAN FACTOR AT START OF CYCLE = *,E16.9)              CONTR947
C                                                                       CONTR948
C     START OF ITERATION WITHIN CYCLE                                   CONTR949
C                                                                       CONTR950
  900 CONTINUE                                                          CONTR951
C                                                                       CONTR952
      REWIND 19                                                         CONTR953
      DO 910 ML=1,NCNS                                                  CONTR954
      SXXOT(ML)=0.0                                                     CONTR955
  910 CONTINUE                                                          CONTR956
      DO 920 N=1,NUMEL                                                  CONTR957
      WRITE (19) SXXOT,SXXOT,SXXOT                                      CONTR958
  920 CONTINUE                                                          CONTR959
C                                                                       CONTR960
      IF (NBEAMX.EQ.0) GO TO 950                                        CONTR961
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      REWIND 23                                                          CONTR962
      DO 930 ML=1,NULAYB                                                 CONTR963
      SIBXXC(ML)=0.0                                                     CONTR964
  930 CONTINUE                                                           CONTR965
      DO 940 N=1,NBEAMX                                                  CONTR966
      WRITE (23) SIBXXC                                                  CONTR967
  940 CONTINUE                                                           CONTR968
  950 CONTINUE                                                           CONTR969
      DO 960 I=1,NA1                                                     CONTR970
      DISPO(I)=0.0                                                       CONTR971
  960 CONTINUE                                                           CONTR972
C                                                                        CONTR973
C                                                                        CONTR974
C     TERMINATION CHECK                                                  CONTR975
C                                                                        CONTR976
      IF (IOUT.NE.3HYES.AND.ICYCLE.LT.LCYCLE) GO TO 1090                 CONTR977
      IF (ECARDS.EQ.3HYES) GO TO 1100                                    CONTR978
C                                                                        CONTR979
C     END OF OVERLOAD SOLUTION PROCEDURE                                 CONTR980
C                                                                        CONTR981
  970 CONTINUE                                                           CONTR982
C                                                                        CONTR983
C     PRINT OUT HISTOGRAM                                                CONTR984
C                                                                        CONTR985
      WRITE (IO,980) FVAL(1),FVAL(2),FVAL(3)                             CONTR986
  980 FORMAT (1H0,//,11X,*SLAB  -FIRST CRACK LOAD = *,F11.4,* KIPS*,//,1CONTR987
     11X,*SLAB  -FIRST CRUSH LOAD = *,F11.4,* KIPS*,//,11X,*SLAB  -FIRSTCONTR988
     2 YIELD LOAD = *,F11.4,* KIPS*,//)                                  CONTR989
C                                                                        CONTR990
      IF (NBEAMX.NE.0) WRITE (IO,990) FVAL(4),FVAL(5),FVAL(6)            CONTR991
  990 FORMAT (1H0,//,11X,*BEAM  -FIRST CRACK LOAD = *,F11.4,* KIPS*,//,1CONTR992
     11X,*BEAM  -FIRST CRUSH LOAD = *,F11.4,* KIPS*,//,11X,*BEAM  -FIRSTCONTR993
     2 YIELD LOAD = *,F11.4,* KIPS*,//)                                  CONTR994
C                                                                        CONTR995
      I=(NSIGNI(2)-3)/5+1                                                CONTR996
      WRITE (IO,1000) NVAL(1),I,PMAX,NVAL(4),FVAL(7)                     CONTR997
 1000 FORMAT (1H0,//,11X*MAXIMUM DISPLACEMENT HAS BEEN EXCEEDED (NODE)   CONTR998
     1=*,5X,A3,* (*,I3,*)*,//,11X,*SPECIFIED OVERLOAD RATIO OF *,E10.3,*CONTR999
     2 EXCEEDED=*,5X,A3,//,11X,*RATIO OF TOTAL LOAD TO THE SPECIFIED OVECONT1000
     3RLOAD  =*,F8.3,//)                                                 CONT1001
      IF (NBEAMX.NE.0) WRITE (IO,1010) NVAL(2),IVAL(2),IVAL(3)           CONT1002
 1010 FORMAT (1H0,//,11X,*MAX SHEAR HAS BEEN EXCEEDED(BEAM ELEMENT,LAYERCONT1003
     1)=*,5X,A3,*(*,I3,*,*,I2,*)*,//)                                    CONT1004
C                                                                        CONT1005
      M=ICRS8                                                            CONT1006
      I=ICRS10                                                           CONT1007
      WRITE (IO,1020) NVAL(3),CRS7,M,CRS9,I                              CONT1008
 1020 FORMAT (1H0,/,11X,*MAXIMUM SLAB CRACK WIDTH HAS BEEN EXCEEDED =*,5CONT1009
     1X,A3,/,16X,*CRACK WIDTH*,9X,*= *,F8.5,* (IN)*,/,16X,*ELEMENT NUMBECONT1010
     2R      = *,I8,/,16X,*CRACK ANGLE*,9X,*= *,F8.3,* (DEGREES)*,/,16X,CONT1011
     3*CRACK LOCATION      = *,4X,A4,//)                                CONT1012
      I=ICRB5                                                            CONT1013
      M=ICRB2                                                            CONT1014
      IF (NBEAMX.NE.0.AND.M.GT.0) WRITE (IO,1030) NVAL(5),CRB10,I        CONT1015
 1030 FORMAT (1H0,/,11X,*MAXIMUM BEAM CRACK WIDTH HAS BEEN EXCEEDED =*,5CONT1016
     1X,A3,/,16X,*CRACK WIDTH*,9X,*= *,F8.5,* (IN)*,/,16X,*ELEMENT NUMBECONT1017
     2R      = *,I8,//)                                                 CONT1018
      II=1                                                               CONT1019
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      IF (NBEAMX.EQ.0) II=2                                              CONT1020
      DO 1080 N=II,2                                                     CONT1021
C                                                                        CONT1022
C     PRINT OUT THE BEAM CHECKS IF N=1                                   CONT1023
C     PRINT OUT THE SLAB CHECKS IF N=2                                   CONT1024
C                                                                        CONT1025
C                                                                        CONT1026
      IF (N.EQ.1) WRITE (IO,1040) (J,J=1,KMAT)                           CONT1027
 1040 FORMAT (1H0,//,11X,*BEAM TERMINATION CHECKS  /  MATERIAL TYPE =*,5CONT1028
     1X,6(I1,10X))                                                       CONT1029
C                                                                        CONT1030
      IF( N.EQ.2)                                                        CONT1031
     *WRITE(IO,153) (J,J=1,NSMAT)                                        CONT1032
  153 FORMAT(1H0,//,11X,*SLAB TERMINATION CHECKS  /  MATERIAL TYPE =*,   CONT1033
     ** CONCRETE/STEEL-*,6(I1,10X))                                      CONT1034
C                                                                        CONT1035
      WRITE (IO,1050)                                                    CONT1036
 1050 FORMAT (1H ,10X,*FOR EXCEEDING LIMITS ON*)                         CONT1037
C                                                                        CONT1038
      ML=NSMAT+1                                                         CONT1039
      DO 1080 I=1,5                                                      CONT1040
C                                                                        CONT1041
C     CHOOSE TITLE                                                       CONT1042
C                                                                        CONT1043
      NSTYPE(1)=10H                                                      CONT1044
      NSTYPE(2)=10H                                                      CONT1045
      NSTYPE(3)=10H                                                      CONT1046
      IF (I.EQ.1) NSTYPE(1)=10HSTRAIN                                    CONT1047
      IF (I.EQ.2) NSTYPE(1)=10HTENSILE ST                                CONT1048
      IF (I.EQ.2) NSTYPE(2)=10HRESS                                      CONT1049
      IF (I.EQ.3) NSTYPE(1)=10HCOMPRESSIV                                CONT1050
      IF (I.EQ.3) NSTYPE(2)=10HE STRESS                                  CONT1051
      IF (I.EQ.4) NSTYPE(1)=10HCRACKED OR                                CONT1052
      IF (I.EQ.4) NSTYPE(2)=10H YIELDED L                                CONT1053
      IF (I.EQ.4) NSTYPE(3)=10HAYERS                                     CONT1054
      IF (I.EQ.5) NSTYPE(1)=10HCRUSHED LA                                CONT1055
      IF (I.EQ.5) NSTYPE(2)=10HYERS                                      CONT1056
C                                                                        CONT1057
C     WRITE VALUES                                                       CONT1058
C                                                                        CONT1059
C                                                                        CONT1060
      IF (N.EQ.1) WRITE (IO,1060) (NSTYPE(J),J=1,3),(NVALB(J,I),J=1,KMATCONT1061
     1)                                                                  CONT1062
 1060 FORMAT (1H ,/,16X,3A10,7X,*=*,4X,6(A3,8X))                         CONT1063
      IF (N.EQ.1) WRITE (IO,1070) ((IVALB(J,K,I),K=1,2),J=1,KMAT)        CONT1064
 1070 FORMAT (1H ,19X,* ELEMENT LAYER *,19X,6(1X,I3,1X,I2,4X))           CONT1065
C                                                                        CONT1066
      IF (N.EQ.2) WRITE (IO,1060) (NSTYPE(J),J=1,3),(NVALS(J,I),J=1,ML)  CONT1067
      IF (N.EQ.2) WRITE (IO,1070) ((IVALS(J,K,I),K=1,2),J=1,ML)          CONT1068
C                                                                        CONT1069
 1080 CONTINUE                                                           CONT1070
C                                                                        CONT1071
      WRITE(IO,1104)                                                     CONT1072
 1104 FORMAT(1H0,5X,                                                     CONT1073
     1≠THIS ANALYTIC MODEL CONSIDERS THE FLEXURAL AND INPLANE≠,          CONT1074
     2/,8X,                                                              CONT1075
     3≠BEHAVIOR OF THE DECK SLAB AND THE FLEXURAL AND AXIAL ≠,           CONT1076
     4/,8X,                                                              CONT1077
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     5≠DEFORMATIONS OF THE BEAMS. TRANSVERSE SHEAR DEFORMATION ≠,        CONT1078
     6/,8X,                                                             CONT1079
     7≠NORMAL TO THE PLANE OF THE DECK SLAB IS NOT CONSIDERED.≠)        CONT1080
C                                                                       CONT1081
C                                                                       CONT1082
      WRITE(IO,1081)                                                    CONT1083
 1081 FORMAT(////,1HO,5X,                                               CONT1084
     1≠THE PREDICTED OVERLOADING OF 6 BRIDGE SUPERSTRUCTURES TO≠,       CONT1085
     2/,8X,                                                             CONT1086
     3≠FAILURE HAVE INDICATED THAT (1) AT THE EARLY PHASES OF≠,         CONT1087
     4/,8X,                                                             CONT1088
     5≠THE OVERLOADING, I.E. CRACKING OF THE SLAB AND/OR BEAMS,≠)       CONT1089
C                                                                       CONT1090
      WRITE(IO,1082)                                                    CONT1091
 1082 FORMAT(8X,                                                        CONT1092
     1≠THE RESULTS MAY BE OFF BY 20 PERCENT, (2) AT FIRST YIELDING≠,    CONT1093
     2/,8X,                                                             CONT1094
     3≠OR A DECREASE IN STIFFNESS THE RESULTS MAY BE OFF BY 20≠,        CONT1095
     4/,8X,                                                             CONT1096
     5≠PERCENT, AND (3) AT THE LATER STAGES OF OVERLOADING≠)            CONT1097
C                                                                       CONT1098
      WRITE(IO,1102)                                                    CONT1099
 1102 FORMAT(8X,                                                        CONT1100
     1≠,I.E. CRUSHING OF THE CONCRETE AND/OR FRACTURING OF THE STEEL≠,  CONT1101
     2/,8X,                                                             CONT1102
     3≠THE RESULTS MAY BE OFF BY 10 PERCENT. THESE CONCLUSIONS≠,        CONT1103
     4/,8X,                                                             CONT1104
     5≠DEPEND ON THE PARTICULAR DISCRETIZATION, METHOD OF STRESS ≠)     CONT1105
C                                                                       CONT1106
      WRITE(IO,1103)                                                    CONT1107
 1103 FORMAT(8X,                                                        CONT1108
     1≠COMPUTATION, AND ITERATION SCHEME CHOSEN. THUS THE CONCLUSIONS≠,  CONT1109
     2/,8X,                                                             CONT1110
     3≠ARE ONLY APPLICABLE TO THE AFOREMENTIONED EXAMPLES. ALSO IT ≠,    CONT1111
     4/,8X,                                                             CONT1112
     5≠SHOULD BE NOTED THAT THE ABOVE PERCENTAGES ARE THE MAXIMUM≠,     CONT1113
     6/,8X,                                                             CONT1114
     7≠OBSERVED DEVIATIONS.≠)                                           CONT1115
C                                                                       CONT1116
C                                                                       CONT1117
      WRITE(IO,1083)                                                    CONT1118
 1083 FORMAT(1HO,5X,                                                    CONT1119
     1≠THE ACCURACY OF THE RESULTS DEPENDS UPON THE ACCURACY OF THE≠,   CONT1120
     2/,8X,                                                             CONT1121
     3≠INPUT OF THE MATERIAL PROPERTIES, DEFINITION OF THE BRIDGE≠,     CONT1122
     4/,8X,                                                             CONT1123
     5≠DESIGN PARAMETERS, AND THE CORRECT SIMULATION OF THE OVERLOAD≠)   CONT1124
C                                                                       CONT1125
      WRITE(IO,1084)                                                    CONT1126
 1084 FORMAT(8X,                                                        CONT1127
     1≠CONFIGURATION. SUBSTANTIAL DEVIATIONS FROM ANY ONE OF THESE≠,    CONT1128
     2/,8X,                                                             CONT1129
     3≠VALUES WILL RESULT IN A SOLUTION THAT MAY NOT BE≠,               CONT1130
     4/,8X,                                                             CONT1131
     5≠REPRESENTATIVE OF THE ACTUAL BRIDGE BEHAVIOR.≠)                  CONT1132
C                                                                       CONT1133
C                                                                       CONT1134
      WRITE(IO,1085)                                                    CONT1135
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 1085 FORMAT(1H0,5X,                                                    CONT1136
     1≠THE AGE OF THE CONCRETE AND THE DETERIORATION OF THE BRIDGE≠,    CONT1137
     2/,8X,                                                             CONT1138
     3≠SUPERSTRUCTURE MUST BE CONSIDERED BY THE USER. THE USER MUST≠,   CONT1139
     4/,8X,                                                             CONT1140
     5≠EXERT JUDGEMENT IN THE CORRECT ASSESMENT OF THESE PARAMETERS.≠)   CONT1141
C                                                                       CONT1142
      WRITE(IO,1086)                                                    CONT1143
 1086 FORMAT(8X,                                                        CONT1144
     1≠ANY SUBSTANTIAL DEVIATION IN THE INPUT FROM THE ACTUAL STATE≠,    CONT1145
     4/,8X,                                                             CONT1146
     3≠OF THE SUPERSTRUCTURE MAY RESULT IN AN INCORRECT SIMULATION≠,     CONT1147
     4/,8X,                                                             CONT1148
     5≠OF THE OVERLOAD RESPONSE OF THE BRIDGE.≠)                        CONT1149
C                                                                       CONT1150
C                                                                       CONT1151
      WRITE(IO,1087)                                                    CONT1152
 1087 FORMAT(1H0,5X,                                                    CONT1153
     1≠CRACK WIDTHS ARE COMPUTED FROM FORMULAE THAT ARE BASED ON≠,       CONT1154
     2/,8X,                                                             CONT1155
     3≠EMPIRICALLY DERIVED RELATIONSHIPS AND ARE THEREFORE CONSIDERED≠,  CONT1156
     4/,8X,                                                             CONT1157
     5≠TO BE APPROXIMATE.≠)                                             CONT1158
C                                                                       CONT1159
C                                                                       CONT1160
      WRITE(IO,1088)                                                    CONT1161
 1088 FORMAT(1H0,5X,                                                    CONT1162
     1≠THE PROGRAM DOES NOT INCLUDE FATIGUE PROVISIONS FOR THE≠,        CONT1163
     2/,8X,                                                             CONT1164
     3≠SUPERSTRUCTURE OR ITS CONSTITUTIVE MATERIALS. IF THE FATIGUE≠,   CONT1165
     4/,8X,                                                             CONT1166
     5≠IS BELIEVED TO BE IMPORTANT, THEN IT MAY BE ADVISABLE TO≠)       CONT1167
C                                                                       CONT1168
      WRITE(IO,1089)                                                    CONT1169
 1089 FORMAT(8X,                                                        CONT1170
     1≠PERFORM A NEW ANALYSIS WITH REDUCED CONCRETE AND/OR STEEL≠,      CONT1171
     2/,8X,                                                             CONT1172
     3≠STRENGTHS.≠)                                                     CONT1173
C                                                                       CONT1174
C                                                                       CONT1175
      WRITE(IO,1091)                                                    CONT1176
 1091 FORMAT(1H0,5X,                                                    CONT1177
     1≠THE ANALYSIS IS CARRIED OUT FOR THE LANE LOCATION OF THE≠,       CONT1178
     2/,8X,                                                             CONT1179
     3≠OVERLOAD VEHICLE THAT IS DEFINED BY THE USER OF THE PROGRAM.≠,   CONT1180
     4/,8X,                                                             CONT1181
     5≠ANY DEVIATION FROM THIS LANE LOADING IN THE ACTUAL OVERLOADING≠) CONT1182
C                                                                       CONT1183
      WRITE(IO,1092)                                                    CONT1184
 1092 FORMAT(8X,                                                        CONT1185
     1≠OF THE BRIDGE MAY RESULT IN A RESPONSE DIFFERENT FROM THAT≠,     CONT1186
     2/,8X,                                                             CONT1187
     3≠PREDICTED BY THE PROGRAM.≠)                                      CONT1188
C                                                                       CONT1189
C                                                                       CONT1190
      WRITE(IO,1093)                                                    CONT1191
 1093 FORMAT(1H0,5X,                                                    CONT1192
     1≠THE ANALYSIS IS CARRIED OUT FOR THE GIVEN LOADING SPECIFIED BY≠, CONT1193
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     2/,8X,                                                              CONT1194
     3≠THE USER. IF DURING THE ACTUAL LOADING OF THE BRIDGE OTHER≠,      CONT1195
     4/,8X,                                                              CONT1196
     5≠VEHICLES OF QUESTICNABLE WEIGHT ARE PRESENT IN ADDITION TO THE≠)  CONT1197
C                                                                        CONT1198
      WRITE(IO,1094)                                                     CONT1199
 1094 FORMAT(8X,                                                         CONT1200
     1≠GIVEN LOADING, THEN THE ACTUAL BRIDGE RESPONSE MAY BE DIFFERENT≠,CONT1201
     2/,8X,                                                              CONT1202
     3≠AS COMPARED TO THAT PREDICTED BY THE PROGRAM.≠)                   CONT1203
C                                                                        CONT1204
C                                                                        CONT1205
      WRITE(IO,1095)                                                     CONT1206
 1095 FCRMAT(1HO,5X,                                                     CONT1207
     1≠THE COMPUTER PROGRAM ASSUMES THAT DYNAMIC EFFECTS ARE NOT≠,       CONT1208
     2/,8X,                                                              CONT1209
     3≠PRESENT. THUS THE VEHICULAR SPEED SHOULD BE REDUCED TO CRAWL≠,    CONT1210
     4/,8X,                                                              CONT1211
     5≠SPEED, I.E. A MAXIMUM OF 5 MPH, DURING THE TRAVEL ACROSS≠)        CONT1212
C                                                                        CONT1213
      WRITE(IO,1096)                                                     CONT1214
 1096 FORMAT(8X,                                                         CONT1215
     1≠THE BRIDGE. IF THE VEHICLE IS TO TRAVEL THE BRIDGE AT NORMAL≠,    CONT1216
     2/,8X,                                                              CONT1217
     3≠TRAFFIC SPEED, THEN THE ACTUAL VEHICULAR LOAD SHOULD BE≠,         CONT1218
     4/,8X,                                                              CONT1219
     5≠INCREASED BY SOME IMPACT FACTOR FOR ANALYSIS PURPOSES.≠)          CONT1220
C                                                                        CONT1221
C                                                                        CONT1222
      WRITE(IO,1097)                                                     CONT1223
 1097 FORMAT(1HO,5X,                                                     CONT1224
     1≠IF THE OVERLOAD ANALYSIS IS CARRIED OUT FOR THE MAXIMUM≠,         CONT1225
     2/,8X,                                                              CONT1226
     3≠FLEXURAL RESPONSE, THEN THE USER SHOULD ALSO CONSIDER THE≠,       CONT1227
     4/,8X,                                                              CONT1228
     5≠NECESSITY OF AN ANALYSIS FOR A LOAD CONFIGURATION/POSITION≠)      CONT1229
C                                                                        CONT1230
      WRITE(IO,1098)                                                     CONT1231
 1098 FORMAT(8X,                                                         CONT1232
     1≠WHICH WILL PRODUCE A MAXIMUM HORIZONTAL SHEAR CONDITION ≠,        CONT1233
     2/,8X,                                                              CONT1234
     3≠IN THE BEAMS NEAR THE SUPPORTS.≠)                                 CONT1235
C                                                                        CONT1236
C                                                                        CONT1237
      WRITE(IO,1099)                                                     CONT1238
 1099 FCRMAT(1HO,5X,                                                     CONT1239
     1≠IT IS ADVISABLE THAT THE USER CONSIDERS THE MAXIMUM DEFLECTION≠,   CONT1240
     2/,8X,                                                              CONT1241
     3≠OF THE BRIDGE SUPERSTRUCTURE AS COMPARED TO THE DESIGN≠,          CONT1242
     4/,8X,                                                              CONT1243
     5≠DEFLECTION. THE DESIGN DEFLECTION IS TO BE OBTAINED BY THE USER.≠CONT1244
     6 )                                                                 CONT1245
C                                                                        CONT1246
C                                                                        CONT1247
      WRITE(IO,1101)                                                     CONT1248
 1101 FORMAT(1HO,5X,                                                     CONT1249
     1≠NO SPECIAL STRESS CHECKS HAVE BEEN UNDERTAKEN FOR THE BEAMS≠,     CONT1250
     2/,8X,                                                              CONT1251
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     3≠WITH DRAPED STRANDS AT THE DRAPE POINTS. THE USER SHOULD≠,          CONT1252
     4/,8X,                                                               CONT1253
     5≠INVESTIGATE THIS MANUALLY IF IT IS PERTINENT.≠)                     CONT1254
C                                                                         CONT1255
      WRITE (IO,40)                                                       CONT1256
C                                                                         CONT1257
      STOP 5                                                              CONT1258
C                                                                         CONT1259
 1090 CONTINUE                                                            CONT1260
C                                                                         CONT1261
C     START OF NEW ITERATION OR TRIAL                                     CONT1262
C                                                                         CONT1263
C                                                                         CONT1264
C     TIME CHECK                                                          CONT1265
C                                                                         CONT1266
      CALL SECOND (TIME)                                                  CONT1267
      IF (TIME.LT.ETIME) GO TO 1140                                       CONT1268
C                                                                         CONT1269
C     CHECK FOR RESTART CARD GENERATION                                   CONT1270
C                                                                         CONT1271
      IF (ECARDS.NE.3HYES) GO TO 970                                      CONT1272
C                                                                         CONT1273
 1100 CONTINUE                                                            CONT1274
C                                                                         CONT1275
C     WRITE END CARDS                                                     CONT1276
C                                                                         CONT1277
      REWIND 19                                                           CONT1278
      REWIND 21                                                           CONT1279
      REWIND 32                                                           CONT1280
      IN=7                                                                CONT1281
      REWIND IN                                                           CONT1282
      WRITE (IN) ICYCLE,ITRIAL,ITER,GAPAC,PFC,HDISP,HFORCE,PFY            CONT1283
C                                                                         CONT1284
      WRITE (IN) FVAL(1),FVAL(2),FVAL(3),FVAL(4),FVAL(5),FVAL(6)          CONT1285
      DO 1110 I=1,NUMEL                                                   CONT1286
      READ (21) SXXOT,SYYOT,SXYOT                                         CONT1287
      READ (19) SIGXXO,SIGYYO,SIGXYO                                      CONT1288
      READ (32) AFT,AST                                                   CONT1289
      WRITE (IN) SXXOT,SYYOT,SXYOT                                        CONT1290
      WRITE (IN) SIGXXO,SIGYYO,SIGXYO                                     CONT1291
      WRITE (IN) AFT,AST                                                  CONT1292
 1110 CONTINUE                                                            CONT1293
C                                                                         CONT1294
      DO 1120 I=1,NUMEL                                                   CONT1295
      READ (32) J,M,N                                                     CONT1296
 1120 WRITE (IN) J,M,N                                                    CONT1297
C                                                                         CONT1298
      WRITE (IN) FORCE,LILA                                               CONT1299
      WRITE (IN) DISPO,FORCEB,FCADD                                       CONT1300
      WRITE (IN) AS1,AF,AS                                                CONT1301
      REWIND 17                                                           CONT1302
      READ (17) FORCEA,DISPLA,FCSADD,ETXX,ETYY,ETXY,CTXX,CTYY,CTXY        CONT1303
      WRITE (IN) FORCEA,DISPLA,FCSADD,ETXX,ETYY,ETXY,CTXX,CTYY,CTXY       CONT1304
C                                                                         CONT1305
      IN=1                                                                CONT1306
      ECARDS=3HNO                                                         CONT1307
      IOUT=3HYES                                                          CONT1308
C                                                                         CONT1309
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      IF (NBEAMX.EQ.0) GO TO 970                                        CONT1310
      REWIND 15                                                         CONT1311
      REWIND 23                                                         CONT1312
      REWIND 25                                                         CONT1313
      REWIND 33                                                         CONT1314
      IN=7                                                              CONT1315
      DO 1130 I=1,NBEAMX                                                CONT1316
      READ (15) SIBXXA                                                  CONT1317
      READ (23) SIBXXC                                                  CONT1318
      READ (25) EPSPS                                                   CONT1319
      WRITE (IN) SIBXXA                                                 CONT1320
      WRITE (IN) SIBXXC                                                 CONT1321
      WRITE (IN) EPSPS                                                  CONT1322
 1130 CONTINUE                                                          CONT1323
      READ (33) ESX                                                     CONT1324
      WRITE (IN) ESX                                                    CONT1325
      IN=1                                                              CONT1326
      GO TO 970                                                         CONT1327
C                                                                       CONT1328
 1140 CONTINUE                                                          CONT1329
C                                                                       CONT1330
C     SOLVE SYSTEM                                                      CONT1331
C                                                                       CONT1332
      REWIND 18                                                         CONT1333
      WRITE (18) DISPO,FORCEB,FCADD                                     CONT1334
      REWIND 29                                                         CONT1335
      WRITE (29) FORCE,LILA                                             CONT1336
C                                                                       CONT1337
      IRS=4                                                             CONT1338
      IOUTS=1                                                           CONT1339
      IF (ITP.EQ.3HYES) ICUTS=3                                         CONT1340
      RETURN                                                            CONT1341
C                                                                       CONT1342
C     SOLVE EQUATIONS                                                   CONT1343
C                                                                       CONT1344
 1150 CONTINUE                                                          CONT1345
C                                                                       CONT1346
      REWIND 31                                                         CONT1347
      REWIND 33                                                         CONT1348
      REWIND 18                                                         CONT1349
      REWIND 29                                                         CONT1350
      REWIND 30                                                         CONT1351
      READ (31) AS1,AF,AS                                               CONT1352
      READ (33) ESX                                                     CONT1353
      READ (18) DISPO,FORCEB,FCADD                                      CONT1354
      READ (29) FORCE,LILA                                              CONT1355
      READ (30) DISP                                                    CONT1356
C                                                                       CONT1357
C     FIND SLAB STRAINS                                                 CONT1358
C                                                                       CONT1359
      CALL PSTRAN (NUMEL,NA1,NANA,NULAY,CUXX,CUYY,CUXY,EIXX,EIYY,EIXY,DICONT1360
     1SP,PDT,PZC,SZC,AFT,AST,NSLAYR)                                    CONT1361
C                                                                       CONT1362
C     FIND BEAM STRAINS                                                 CONT1363
C                                                                       CONT1364
      IF (NBEAMX.NE.0) CALL BSTRAN (NIX,NULAYB,NA1,NBEAMX,EIB,CUB,DUM,DICONT1365
     1SP)                                                               CONT1366
C                                                                       CONT1367
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C     ROUTINES FOR CONVERGENCE AND NO CONVERGENCE                       CONT1368
C                                                                       CONT1369
      PF=1.0                                                            CONT1370
      ITER=ITER+1                                                       CONT1371
      ISTAGE=1                                                          CONT1372
C                                                                       CONT1373
C     FIND SLAB STRESSES                                                CONT1374
C                                                                       CONT1375
      CALL PSTRSS (ISTAGE,PF,NUMEL,NCNS,NULAY,NSLAYR,NSMAT,SIGXXO,SIGYYOCONT1376
     1,SIGXYO,CUXX,CUYY,CUXY,EIXX,EIYY,EIXY,PZC,PDT,DT,SZC,SXXOT,SYYOT,SCONT1377
     2XYOT,AS1,AF,AS,SEMOD,SIGMAP,SPROM,SPRON,NSTYPE,SPHI)              CONT1378
C                                                                       CONT1379
      ISTAGE=ISTAGE+1                                                   CONT1380
      PF=1.0                                                            CONT1381
C                                                                       CONT1382
C     FINC PRESCAN  FACTOR FOR SLAB                                     CONT1383
C                                                                       CONT1384
      CALL PSTRSS (ISTAGE,PF,NUMEL,NCNS,NULAY,NSLAYR,NSMAT,SIGXXO,SIGYYOCONT1385
     1,SIGXYO,CUXX,CUYY,CUXY,EIXX,EIYY,EIXY,PZC,PDT,DT,SZC,SXXOT,SYYOT,SCONT1386
     2XYOT,AS1,AF,AS,SEMOD,SIGMAP,SPROM,SPRON,NSTYPE,SPHI)              CONT1387
C                                                                       CONT1388
C     FIND BEAM STRESSES                                                CONT1389
C                                                                       CONT1390
      IF (NBEAMX.NE.0) CALL BSTRSS (PF,DUM,ZCRD,ETB,CUB,KC,NULAYB,NBEAMXCONT1391
     1,KMAT,SIBXXA,SIBXXC,ESX,RON,ROM,SIGO,FT,RONT,ROMT,ITYPE)          CONT1392
      IF (PF.EQ.0.0) PF=DPFC                                            CONT1393
C                                                                       CONT1394
      WRITE (IO,400) ITRIAL                                             CONT1395
      WRITE (IO,410) ITER                                               CONT1396
C                                                                       CONT1397
C     CHECK PRINT CODES                                                 CONT1398
C                                                                       CONT1399
      IF (RDFPR.NE.3HYES) GO TO 1160                                    CONT1400
      IF (CODEA.NE.3HYES) GO TO 1160                                    CONT1401
C                                                                       CONT1402
      WRITE (IO,420)                                                    CONT1403
      WRITE (IO,430)                                                    CONT1404
      WRITE (IO,440) (M,DISP(5*M-4),DISP(5*M-3),DISP(5*M-2),DISP(5*M-1),CONT1405
     1DISP(5*M),M=1,NUMNP)                                              CONT1406
C                                                                       CONT1407
      WRITE (IO,450)                                                    CONT1408
      WRITE (IO,1510)                                                   CONT1409
      WRITE (IO,440) (M,FORCE(5*M-4),FORCE(5*M-3),FORCE(5*M-2),FORCE(5*MCONT1410
     1-1),FORCE(5*M),M=1,NUMNP)                                         CONT1411
      WRITE (IO,20)                                                     CONT1412
C                                                                       CONT1413
C                                                                       CONT1414
      WRITE (IO,460)                                                    CONT1415
      WRITE (IO,470)                                                    CONT1416
      CALL PRISTR (SIGXXO,SIGYYO,SIGXYO,1.0,19,NULAY,NUMEL,NCNS,NSLAYR,SCONT1417
     1PHI,IO)                                                           CONT1418
C                                                                       CONT1419
      WRITE (IO,460)                                                    CONT1420
      WRITE (IO,480)                                                    CONT1421
      IF (NBEAMX.NE.0) CALL PRISRB (SIBXXC,23,NULAYB,NBEAMX,IO)         CONT1422
C                                                                       CONT1423
C                                                                       CONT1424
 1160 CONTINUE                                                          CONT1425
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C                                                                       CONT1426
C     INCREMENTAL MODE AND PRESCAN  CHECKS                              CONT1427
C                                                                       CONT1428
      IF (IONE.EQ.3HYES.AND.PF.NE.1.0) GO TO 1300                       CONT1429
      IF (IONE.EQ.3HYES) GO TO 1280                                     CONT1430
C                                                                       CONT1431
C     CHECK CONVERGENCE                                                 CONT1432
C                                                                       CONT1433
C     CHECK DISPLACEMENT CONVERGENCE                                    CONT1434
C                                                                       CONT1435
      DO 1170 II=1,NA1                                                  CONT1436
      I=II                                                              CONT1437
      A=DISPO(I)                                                        CONT1438
      B=DISP(I)                                                         CONT1439
      IF (ABS(B).LE.1.0E-09) GO TO 1170                                 CONT1440
      IF (ABS((B-A)/B).GT.TOLDSP) GO TO 1180                            CONT1441
 1170 CONTINUE                                                          CONT1442
C                                                                       CONT1443
C     ROUTINE FOR CONVERGENCE                                           CONT1444
C                                                                       CONT1445
      ICON=4HYES1                                                       CONT1446
      GO TO 1200                                                        CONT1447
 1180 CONTINUE                                                          CONT1448
C                                                                       CONT1449
C     ROUTINE FOR NO CONVERGENCE                                        CONT1450
C                                                                       CONT1451
      ICON=4HNO                                                         CONT1452
      DO 1190 I=1,NA1                                                   CONT1453
 1190 DISPO(I)=DISP(I)                                                  CONT1454
 1200 CONTINUE                                                          CONT1455
C                                                                       CONT1456
      IF (ICON.EQ.4HYES1) GO TO 1280                                    CONT1457
C                                                                       CONT1458
C     CHECK ITERATIONS                                                  CONT1459
C                                                                       CONT1460
      IF (ITER.EQ.LITER) GO TO 1210                                     CONT1461
      IF (ITER.GT.(LITER+1)) GO TO 1280                                 CONT1462
C                                                                       CONT1463
      IF (PF.NE.1.0) GO TO 1250                                         CONT1464
C                                                                       CONT1465
C                                                                       CONT1466
      GO TO 1090                                                        CONT1467
 1210 CONTINUE                                                          CONT1468
C                                                                       CONT1469
C     ITERATIONS EXCEDED LIMIT LITER                                    CONT1470
C                                                                       CONT1471
      ITER=0                                                            CONT1472
      IF (ITRIAL.EQ.LTRIAL) GO TO 1240                                  CONT1473
      ITRIAL=ITRIAL+1                                                   CONT1474
C                                                                       CONT1475
C     REDUCE LOAD INCREMENT                                             CONT1476
C                                                                       CONT1477
      QAPAC=RQAPA*QAPAC                                                 CONT1478
      PFC=1.0                                                           CONT1479
      DO 1220 I=1,NA1                                                   CONT1480
 1220 FORCE(I)=FORCEB(I)*QAPAC+FCADD(I)                                 CONT1481
C                                                                       CONT1482
      WRITE (IO,1230) RQAPA,QAPAC                                       CONT1483
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 1230 FORMAT (/,1H ,5X,*----LOAD STEP WILL BE REDUCED---------*,/,10X,*LCONT1484
     1OAD REDUCTION FACTOR       = *,E16.9,/,10X,*NEW LOAD RATIO        CONT1485
     2      = *,E16.9)                                                  CONT1486
C                                                                       CONT1487
      GO TO 900                                                         CONT1488
 1240 CONTINUE                                                          CONT1489
C                                                                       CONT1490
C     TRIALS EXCEEDED LIMIT LTRIAL                                      CONT1491
C                                                                       CONT1492
      IF (PF.EQ.1.0) GO TO 1280                                         CONT1493
      PFC=PFC*DPFC                                                      CONT1494
      ITER=LITER+1                                                      CONT1495
 1250 CONTINUE                                                          CONT1496
C                                                                       CONT1497
C     REDUCE LOAD INCREMENT SINCE PRESCAN WAS NOT SATISFIED             CONT1498
C                                                                       CONT1499
      PFC=PF*PFC                                                        CONT1500
      A=QAPAC*PFC                                                       CONT1501
      DO 1260 I=1,NA1                                                   CONT1502
      FORCE(I)=FORCEB(I)*QAPAC*PFC+FCADD(I)                             CONT1503
 1260 CONTINUE                                                          CONT1504
C                                                                       CONT1505
      WRITE (IO,1270) PF,A                                              CONT1506
 1270 FORMAT (/,1H ,5X,*----LOAD STEP WILL BE REDUCED---------*,/,10X,*PCONT1507
     1RESCAN REDUCTION FACTOR    = *,E16.9,/,10X,*NEW LOAD RATIO        CONT1508
     2      = *,E16.9)                                                 CONT1509
C                                                                       CONT1510
      GO TO 900                                                         CONT1511
 1280 CONTINUE                                                          CONT1512
C                                                                       CONT1513
C     CONVERGENCE                                                       CONT1514
C                                                                       CONT1515
      DO 1290 I=1,NA1                                                   CONT1516
      FORCE(I)=FORCEB(I)*QAPAC*PFC                                      CONT1517
 1290 CONTINUE                                                          CONT1518
C                                                                       CONT1519
C                                                                       CONT1520
      GO TO 1310                                                        CONT1521
 1300 CONTINUE                                                          CONT1522
      IF (PRECRK.NE.3HYES) GO TO 1280                                   CONT1523
C                                                                       CONT1524
C     PRECRACK LAYERS SINCE PRESCAN  FACTOR SHOWS LAYERS WILL FAIL WITH CONT1525
C         LITTLE OR NO ADDITIONAL LOAD APPLIED                          CONT1526
C                                                                       CONT1527
      PFC=0.0                                                           CONT1528
 1310 CONTINUE                                                          CONT1529
C                                                                       CONT1530
C     START PROCEDURE FOR END OF CYCLE                                  CONT1531
C                                                                       CONT1532
      REWIND 17                                                         CONT1533
      READ (17) FORCEA,DISPLA,FCSADD,ETXX,ETYY,ETXY,CTXX,CTYY,CTXY      CONT1534
C                                                                       CONT1535
      IF (ICHECK.EQ.NCHECK) ICHECK=-1                                   CONT1536
      IF (PFC.EQ.0.0) GO TO 1360                                        CONT1537
C                                                                       CONT1538
C     FIND FINAL SLAB AND BEAM STRESSES                                 CONT1539
C                                                                       CONT1540
      REWIND 6                                                          CONT1541
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      REWIND 19                                                          CONT1542
      REWIND 21                                                          CONT1543
      DO 1330 I=1,NUMEL                                                  CONT1544
      READ (21) SXXOT,SYYOT,SXYOT                                        CONT1545
      READ (19) SIGXXO,SIGYYO,SIGXYO                                     CONT1546
      DO 1320 J=1,NCNS                                                   CONT1547
      SXXOT(J)=SXXOT(J)+SIGXXO(J)                                        CONT1548
      SYYOT(J)=SYYOT(J)+SIGYYO(J)                                        CONT1549
      SXYOT(J)=SXYOT(J)+SIGXYO(J)                                        CONT1550
 1320 CONTINUE                                                           CONT1551
      WRITE (6) SXXOT,SYYOT,SXYOT                                        CONT1552
 1330 CONTINUE                                                           CONT1553
      IF (NBEAMX.EQ.0) GO TO 1360                                        CONT1554
      REWIND 3                                                           CONT1555
      REWIND 15                                                          CONT1556
      REWIND 23                                                          CONT1557
      DO 1350 I=1,NBEAMX                                                 CONT1558
      READ (23) SIBXXC                                                   CONT1559
      READ (15) SIBXXA                                                   CONT1560
      DO 1340 J=1,NULAYB                                                 CONT1561
      SIBXXA(J)=SIBXXA(J)+SIBXXC(J)                                      CONT1562
 1340 CONTINUE                                                           CONT1563
      WRITE (3) SIBXXA                                                   CONT1564
 1350 CONTINUE                                                           CONT1565
 1360 CONTINUE                                                           CONT1566
C                                                                        CONT1567
C     CHECK LAYERS FOR FAILURE AND FIND FICTITIOUS FORCE VECTOR IF       CONT1568
C          PFC DOES NOT EQUAL ZERO FOR BOTH SLAB AND BEAM                CONT1569
C                                                                        CONT1570
      CALL PCHECK (IO,NA1,NUMEL,NCNS,NULAY,NSLAYR,NSMAT,NANA,PZC,PDT,SZCCONT1571
     1,SDT,DT,ELLA,ELLB,NPI,NPJ,NPK,NPL,FCADD,CTXX,CTYY,CTXY,CUXX,CUYY,CCONT1572
     2UXY,ETXX,ETYY,ETXY,EIXX,EIYY,EIXY,SXXOT,SYYOT,SXYOT,SIGXXO,SIGYYO,CONT1573
     3SIGXYO,AS1,AF,AS,AFT,AST,NSTYPE,SPHI,SIGMAP)                      CONT1574
C                                                                        CONT1575
      IF (NBEAMX.NE.0) CALL BCHECK (KC,NIX,NBEAMX,NULAYB,KMAT,NA1,IO,CUBCONT1576
     1,EIB,DUM,NPIX,NPKX,SIBXXC,SIBXXA,ITYPE,FT,SIGO,ESX,EDOWNT,EDOWN,DICONT1577
     2SP,DISPLA,ZCRD,XLNGTH,ASXLR,EPSPS,STRAN,FCADD,IOUT)               CONT1578
C                                                                        CONT1579
      REWIND 33                                                          CONT1580
      WRITE (33) ESX                                                     CONT1581
C                                                                        CONT1582
      IF (PFC.NE.0.0) GO TO 1370                                         CONT1583
C                                                                        CONT1584
      ITP=3HNO                                                           CONT1585
      GO TO 860                                                          CONT1586
 1370 CONTINUE                                                           CONT1587
      ITP=3HYES                                                          CONT1588
C                                                                        CONT1589
      IF (PLTCRD.EQ.3HYES) WRITE (8,1380) ICYCLE                         CONT1590
 1380 FORMAT (I5)                                                        CONT1591
C                                                                        CONT1592
C     CHECK BEAM CRACK WIDTH                                             CONT1593
C                                                                        CONT1594
      I=ICRB2                                                            CONT1595
      IF (I.NE.0.AND.NBEAMX.NE.0) CALL BEAMC (NBEAMX,NULAYB,NA1,EIB,CUB,CONT1596
     1SIBXXA,SIBXXC,EPSPS,ITYPE,ASXLR,AILR,KC,ZCRD,TSHEAR,ESX,DISPLA)    CONT1597
C                                                                        CONT1598
C     ACCUMULATE FIELD QUANTITIES                                        CONT1599
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C                                                                       CONT1600
      CALL ACCUMU (NUMEL,NA1,NBEAMX,NULAYB,NCNS,NULAY,CTXX,CTYY,CTXY,CUXCONT1601
     1X,CUYY,CUXY,ETXX,ETYY,ETXY,EIXX,EIYY,EIXY,SXXOT,SYYOT,SXYOT,SIGXXCONT1602
     2,SIGYYO,SIGXYO,DISPLA,DISP,FORCE,FORCEA,ESX,ITYPE,ZCRD,DUM,EPSPS,ACONT1603
     3S1,AFT,AST,SIBXXC,SIBXXA,AF,AS)                                   CONT1604
C                                                                       CONT1605
      REWIND 17                                                         CONT1606
      WRITE (17) FORCEA,DISPLA,FCSADD,ETXX,ETYY,ETXY,CTXX,CTYY,CTXY     CONT1607
      REWIND 18                                                         CONT1608
      WRITE (18) DISPO,FORCEB,FCADD                                     CONT1609
C                                                                       CONT1610
      QAPAC=QAPAC*PFC                                                   CONT1611
C                                                                       CONT1612
C     PRINT FORCE AND DISPLACEMENT VECTORS                              CONT1613
C                                                                       CONT1614
      CALL QPRINT (HDISP,HFORCE,RDISP,RFORCE,RDFPR,NSLAYR,NULAY,NCNS,NUMCONT1615
     1EL,AFT,AST,AS1,NA1,NUMNP,IO,FORCEA,DISPLA)                        CONT1616
C                                                                       CONT1617
C     PRINT SLAB INTERNAL FORCES                                        CONT1618
C                                                                       CONT1619
      CALL PFORCE (IO,NUMEL,NCNS,NULAY,NSLAYR,RDFPR,6,PZC,PDT,DT,SDT,SZCCONT1620
     1,SXXOT,SYYOT,SXYOT)                                               CONT1621
C                                                                       CONT1622
C     PRINT BEAM INTERNAL FORCES                                        CONT1623
C                                                                       CONT1624
      IF (NBEAMX.NE.0) CALL BFORCE (NULAYB,NBEAMX,IO,DUM,RDFPR,3,ASXLR,SCONT1625
     1IBXXA,ZCRD)                                                       CONT1626
C                                                                       CONT1627
      IF (PLTCRD.EQ.3HYES) END FILE 8                                   CONT1628
C                                                                       CONT1629
C     CHECK PRINT CODE                                                  CONT1630
C                                                                       CONT1631
      IF (RDFPR.NE.3HYES) GO TO 1420                                    CONT1632
      WRITE (IO,1390)                                                   CONT1633
 1390 FORMAT (//,10X,*TOTAL ACCUMULATED STRESSES IN SLAB LAYERS*,/,10X,*CONT1634
     1(STRESS IS IN KSI, ANGLES ARE IN DEGREES*,/,10X,* + = TENSION, - =CONT1635
     2 COMPRESSION)*,/)                                                 CONT1636
      WRITE (IO,470)                                                    CONT1637
C                                                                       CONT1638
C     PRINT SLAB STRESSES                                               CONT1639
C                                                                       CONT1640
      CALL PRISTR (SXXOT,SYYOT,SXYOT,1.0,6,NULAY,NUMEL,NCNS,NSLAYR,SPHI,CONT1641
     1IO)                                                               CONT1642
C                                                                       CONT1643
      WRITE (IO,1400)                                                   CONT1644
 1400 FORMAT (//,10X,*TOTAL ACCUMULATED STRESSES IN BEAM LAYERS*,/,10X,*CONT1645
     1(STRESS IS IN KSI, + = TENSION, - = COMPRESSION)*,/)              CONT1646
      WRITE (IO,480)                                                    CONT1647
C                                                                       CONT1648
C     PRINT BEAM STRESSES                                               CONT1649
C                                                                       CONT1650
      IF (NBEAMX.NE.0) CALL PRISRB (SIBXXA,3,NULAYB,NBEAMX,IO)          CONT1651
C                                                                       CONT1652
      WRITE (IO,1410)                                                   CONT1653
 1410 FORMAT (//10X,*TOTAL NORMAL, SHEAR, AND PRINCIPAL STRESSES IN BEAMCONT1654
     1*/,10X,*(STRESS IS IN KSI, ANGLES ARE IN DEGREES*,/,10X,* + = TENSCONT1655
     2ION, - = COMPRESSION)*,/)                                         CONT1656
      WRITE (IO,480)                                                    CONT1657
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C                                                                       CONT1658
 1420 CONTINUE                                                          CONT1659
C                                                                       CONT1660
C     FIND SHEAR STRESSES AND PRINCIPAL STRESSES FOR THE BEAM           CONT1661
C                                                                       CONT1662
      IF (NBEAMX.NE.0) CALL SHEAR (NULAYB,NPERBM,XLNGTH,SIBXXA,ASXLR,TSHCONT1663
     1EAR,ZCRD,ITYPE,KC,NCBM,IO,DUM,RDFPR,EXTRA,EXTRA1,EXTRA2,EXTRA3,EXTCONT1664
     2RA4,EXTRA5,EXTRA6,EXTRA7,NBEAMX)                                  CONT1665
C                                                                       CONT1666
C     CHECK PRINT CODE                                                  CONT1667
C                                                                       CONT1668
      IF (RDFPR.NE.3HYES) GO TO 1540                                    CONT1669
      WRITE (IO,20)                                                     CONT1670
C                                                                       CONT1671
C     PRINT STRAINS                                                     CONT1672
C                                                                       CONT1673
      IF (CODET.EQ.3HYES) CALL STOTL (IC,NCNS,NULAY,NUMEL,NSLAYR,PZC,PDTCONT1674
     1,DT,SZC,SPHI,CTXX,CTYY,CTXY,ETXX,ETYY,ETXY)                       CONT1675
C                                                                       CONT1676
C     PRINT CRACK/CRUSH/YIELD ANGLE IN SLAB LAYERS                      CONT1677
C                                                                       CONT1678
      WRITE (IO,1430)                                                   CONT1679
 1430 FORMAT (1H0,5X,*ANGLES SHOWING DIRECTION OF PRINCIPAL AXIS, FIRST CONT1680
     1CRACK,*,/,5X,* AND SECOND CRACK (ANGLE = 999.0 IF NO CRACK)*,/,5X,CONT1681
     2* ANGLES ARE IN DEGREES*)                                         CONT1682
C                                                                       CONT1683
      WRITE (IO,1440)                                                   CONT1684
 1440 FORMAT (1H0,5X,*   EL  LAYER   PRINCIPAL*,8X,*FIRST*,18X,*SECOND*)CONT1685
      REWIND 32                                                         CONT1686
      I=NULAY+1                                                         CONT1687
      DO 1490 N=1,NUMEL                                                 CONT1688
      READ (32) AFT,AST                                                 CONT1689
      DO 1460 M=1,NULAY                                                 CONT1690
      IF (AS1(N,M).EQ.999.0) GO TO 1460                                 CONT1691
      WRITE (IO,1450) N,M,AS1(N,M),AF(N,M),AFT(M),AS(N,M),AST(M)        CONT1692
 1450 FORMAT (1H ,5X,I5,2X,I5,F12.6,2X,F12.6,1H-,A5,2X,F12.6,1H-,A5)    CONT1693
 1460 CONTINUE                                                          CONT1694
      IF (NSLAYR.EQ.0) GO TO 1490                                       CONT1695
      DO 1480 M=I,NCNS                                                  CONT1696
      IF (AS1(N,M).EQ.999.0) GO TO 1480                                 CONT1697
      WRITE (IO,1470) N,M,AS1(N,M),AFT(M)                               CONT1698
 1470 FORMAT (1H ,5X,I5,2X,I5,F12.6,14X,1H-,A5)                         CONT1699
 1480 CONTINUE                                                          CONT1700
 1490 CONTINUE                                                          CONT1701
C                                                                       CONT1702
C     PRINT FICTITIOUS FORCE VECTOR                                     CONT1703
C                                                                       CONT1704
      IF (CODEA.NE.3HYES) GO TO 1520                                    CONT1705
      WRITE (IO,20)                                                     CONT1706
      WRITE (IO,1500)                                                   CONT1707
 1500 FORMAT (///9X,*FICTIOUS NODAL POINT FORCE VECTOR*)                CONT1708
      WRITE (IO,1510)                                                   CONT1709
 1510 FORMAT (1H0,5X,*NODAL POINTS*,8X,*U-LOAD*,11X,*V-LOAD*,12X,*W-LOADCONT1710
     1*,12X,*MX-LOAD*,11X,*MY-LOAD*,//)                                CONT1711
      WRITE (IO,440) (M,FCADD(5*M-4),FCADD(5*M-3),FCADD(5*M-2),FCADD(5*MCONT1712
     1-1),FCADD(5*M),M=1,NUMNP)                                         CONT1713
 1520 CONTINUE                                                          CONT1714
C                                                                       CONT1715
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C     DO PRINTER PLOTS FOR BEAM/SLAB                                    CONT1716
C                                                                       CONT1717
      IF (PRINTB.NE.3HYES.AND.PRINTS.NE.3HYES) GO TO 1540               CONT1718
      IRS=5                                                             CONT1719
      IOUTS=4                                                           CONT1720
      RETURN                                                            CONT1721
C                                                                       CONT1722
 1530 CONTINUE                                                          CONT1723
      REWIND 17                                                         CONT1724
      REWIND 18                                                         CONT1725
      REWIND 29                                                         CONT1726
      REWIND 31                                                         CONT1727
      READ (17) FORCEA,DISPLA,FCSADD,ETXX,ETYY,ETXY,CTXX,CTYY,CTXY      CONT1728
      READ (18) DISPO,FORCEB,FCADD                                      CONT1729
      READ (29) FORCE,LILA                                              CONT1730
      READ (31) AS1,AF,AS                                               CONT1731
C                                                                       CONT1732
C     SET UP DISPLACEMENT AND FORCE PRINT CONTROLS                      CONT1733
C                                                                       CONT1734
 1540 CONTINUE                                                          CONT1735
      I=NSIGNI(2)                                                       CONT1736
      RDISP=DISPLA(I)/HDISP                                             CONT1737
      I=NSIGNI(1)                                                       CONT1738
      RFORCE=FORCEA(I)/HFORCE                                           CONT1739
      RDFPR=3HNO                                                        CONT1740
      IF (ABS(RDOLD-RDISP).GE.RDPR-0.0001) GO TO 1550                   CONT1741
      IF (ABS(RFOLD-RFORCE).GE.RFPR-.0001) GO TO 1550                   CONT1742
      GO TO 1560                                                        CONT1743
 1550 CONTINUE                                                          CONT1744
      RFOLD=RFORCE                                                      CONT1745
      RDOLD=RDISP                                                       CONT1746
      RDFPR=3HYES                                                       CONT1747
 1560 CONTINUE                                                          CONT1748
C                                                                       CONT1749
C     PERFORM TERMINATION CHECKS                                        CONT1750
C                                                                       CONT1751
      IF (ICHECK.EQ.NCHECK) ICHECK=-1                                   CONT1752
      IF (QAPAC.GE.(QAPA*CQAPA)) ICHECK=-1                              CONT1753
      ICHECK=ICHECK+1                                                   CONT1754
      I=NSIGNI(2)                                                       CONT1755
      IF (ABS(DISPLA(I)).GE.DSPMAX) IOUT=3HYES                          CONT1756
      IF (ABS(DISPLA(I)).GE.DSPMAX) NVAL(1)=3HYES                       CONT1757
      IF (NVAL(4).EQ.3HYES) IOUT=3HYES                                  CONT1758
      IF (NVAL(2).EQ.3HYES) IOUT=3HYES                                  CONT1759
      M=ICRS10                                                          CONT1760
      A=CRS5                                                            CONT1761
      IF (M.EQ.4HTOP ) A=CRS6                                           CONT1762
      IF (CRS7.GE.A) NVAL(3)=3HYES                                      CONT1763
      IF (NVAL(3).EQ.3HYES) IOUT=3HYES                                  CONT1764
C                                                                       CONT1765
      DO 1590 I=1,5                                                     CONT1766
C                                                                       CONT1767
C     CHECK VALUES FOR SLAB                                             CONT1768
C                                                                       CONT1769
      ML=NSMAT+1                                                        CONT1770
      DO 1570 J=1,ML                                                    CONT1771
      IF (NVALS(J,I).EQ.3HYES) IOUT=3HYES                               CONT1772
 1570 CONTINUE                                                          CONT1773
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C                                                                       CONT1774
C     CHECK VALUES FOR BEAM                                             CONT1775
C                                                                       CONT1776
      IF (NBEAMX.EQ.0) GO TO 1590                                       CONT1777
      DO 1580 J=1,KMAT                                                  CONT1778
      IF (NVALB(J,I).EQ.3HYES) IOUT=3HYES                               CONT1779
 1580 CONTINUE                                                          CONT1780
C                                                                       CONT1781
      M=ICRB2                                                           CONT1782
      IF (M.GT.0.AND.CRB10.GE.CRB9) NVAL(5)=3HYES                       CONT1783
      IF (NVAL(5).EQ.3HYES) IOUT=3HYES                                  CONT1784
 1590 CONTINUE                                                          CONT1785
C                                                                       CONT1786
      GO TO 860                                                         CONT1787
C                                                                       CONT1788
C     AN EXIT PROCEDURE                                                 CONT1789
C                                                                       CONT1790
 1600 CONTINUE                                                          CONT1791
      WRITE (IO,1610)                                                   CONT1792
 1610 FORMAT (1H0,*SCALING RATIO IS LESS THAN 1.0 OR IS INFINITE--------CONT1793
     1--EXECUTION IS TERMINATED*)                                       CONT1794
      STOP 5                                                            CONT1795
      RETURN                                                            CONT1796
      END                                                               CONT1797
      SUBROUTINE READCN (NUMEL,NUMNP,LWIDTH,ISCALE,IDEAD,ICMPLT,PRECRK,FREADCN 2
     1LTCRD,ICARDS,ECARDS,CODEA,CODET,PRINTB,PRINTS,DGX,DGY,ETIME,NSIGNIREADCN 3
     2,DSPMAX,TOLDSP,RDPR,RFPR,NTRIAL,NITER,LITER,LTRIAL,PCTT,PCTC,LCYCLREADCN 4
     3E,RRATIO,TOLF,QAPA,RQAPA,CQAPA,NITERD,INOTEN,OLOAD,PMAX,NCHECK,DPFREADCN 5
     4C,NREADB,KIN,KPS,KC,KMAT,FTOL,CTOL)                               READCN 6
C                                                                       READCN 7
C     THIS SUBROUTINE READS INPUT DATA AND INITIALIZES                  READCN 8
C                                                                       READCN 9
      COMMON /CB4/ IN,IC                                                READCN10
      COMMON /SKEW/ PHI,AU(2,2),AO(3,3),DS(3,3)                         READCN11
      COMMON /SEARCH/ ISRCH,ISRT                                        READCN12
C                                                                       READCN13
      DIMENSION NSIGNI(2)                                               READCN14
C                                                                       READCN15
      WRITE (IO,10)                                                     READCN16
   10 FORMAT (1H0)                                                      READCN17
C                                                                       READCN18
      WRITE (IO,20) NUMEL,NUMNP                                         READCN19
   20 FORMAT (//,5X,*NUMBER OF SLAB ELEMENTS, NUMEL                =*,I8,READCN20
     1//,5X,*NUMBER OF NODAL POINTS, NUMNP                  =*,I8,1X)  READCN21
C                                                                       READCN22
      WRITE (IO,30) LWIDTH                                              READCN23
   30 FORMAT (//,5X,*HALF BANDWIDTH, LWIDTH                        =*,I8,READCN24
     11X)                                                               READCN25
C                                                                       READCN26
      WRITE (IO,10)                                                     READCN27
      WRITE (IO,10)                                                     READCN28
C                                                                       READCN29
      READ (IN,40) ISCALE,IDEAD,MODES                                   READCN30
   40 FORMAT (2X,A3,2X,A3,2X,A3)                                        READCN31
      WRITE (IO,50) ISCALE,IDEAD,MODES                                  READCN32
   50 FORMAT (//,5X,*SCALE INITIAL SOLUTION AND PRESCRIBED FORCES =*,5X,READCN33
     1A3,//,5X,*IS THERE A DEAD LOAD ON THE STRUCTURE, IDEAD =*,5X,A3,//READCN34
     2,5X,*SOLUTION MODE IS ITERATIVE, MODES            =*,5X,A3,1X)    READCN35
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C                                                                       READCN36
      READ (IN,40) ICARDS,ECARDS                                        READCN37
      WRITE (IO,60) ICARDS,ECARDS                                       READCN38
   60 FORMAT (//,5X,*ARE THERE INITIAL START CARDS, ICARDS          =*,5X,READCN39
     1A3,//,5X,*WILL THERE BE END CARDS, ECARDS                  =*,5X,A3,1XREADCN40
     2)                                                                 READCN41
C                                                                       READCN42
C                                                                       READCN43
      READ (IN,40) PRINTB,PRINTS                                        READCN44
      WRITE (IO,70) PRINTB,PRINTS                                       READCN45
   70 FORMAT (//,5X,*PRINTER PLOT FOR THE BEAMS, PRINTB             =*,5X,READCN46
     1A3,//,5X,*PRINTER PLOT FOR THE SLAB, PRINTS                =*,5X,A3,1XREADCN47
     2)                                                                 READCN48
C                                                                       READCN49
      READ (IN,90) DGX,DGY                                              READCN50
      WRITE (IO,80) DGX,DGY                                             READCN51
   80 FORMAT (//,5X,*GRAPH LENGTH IN X DIRECTION ACROSS THE PAGE   =*,F8.READCN52
     12,* (IN)*,//,5X,*GRAPH LENGTH IN Y DIRECTION DOWN THE PAGE     =*,FREADCN53
     28.2,* (IN)*,1X)                                                   READCN54
C                                                                       READCN55
C                                                                       READCN56
      READ (IN,90) ETIME                                                READCN57
   90 FORMAT (8F10.0)                                                   READCN58
      WRITE (IO,100) ETIME                                              READCN59
  100 FORMAT (//,5X,*MAXIMUM RUN TIME (SECONDS), ETIME              =*,F8.READCN60
     12,1X)                                                             READCN61
C                                                                       READCN62
      READ (IN,110) NSIGNI(1),NSIGNI(2)                                 READCN63
  110 FORMAT (16I5)                                                     READCN64
      WRITE (IO,120) NSIGNI(1),NSIGNI(2)                                READCN65
  120 FORMAT (//,5X,*FORCE (W-DIRECTION) NODAL POINT                =*,I8,READCN66
     1//,5X,*DISPLACEMENT (W-DIRECTION) NODAL POINT       =*,I8,1X)     READCN67
C                                                                       READCN68
      READ (IN,90) DSPMAX,OLOAD,PMAX                                    READCN69
      WRITE (IO,130) DSPMAX,OLOAD,PMAX                                  READCN70
  130 FORMAT (//,5X,*MAXIMUM DISPLACEMENT FOR SIGNIFICANT POINT    =*,F8.READCN71
     14,* (IN)*,//,5X,*SPECIFIED OVERLOAD                          =*,FREADCN72
     28.3,* (KIPS)*,//,5X,*MAXIMUM RATIO OF APPLIED LOAD TO OVERLOAD    READCN73
     33=*,F8.3,/,1X)                                                    READCN74
C                                                                       READCN75
      IF (DSPMAX.EQ.0.0) DSPMAX=1.0E+20                                 READCN76
      IF (OLOAD.EQ.0.0) OLOAD=1.0                                       READCN77
      IF (PMAX.EQ.0.0) PMAX=1.0E+20                                     READCN78
C                                                                       READCN79
      READ (IN,90) QAPA                                                 READCN80
      WRITE (IO,140) QAPA                                               READCN81
  140 FORMAT (//,5X,*FORCE RATIO INCREMENT ,QAPA                    =*,F8.READCN82
     13,1X)                                                             READCN83
C                                                                       READCN84
      READ (IN,90) RDPR,RFPR                                            READCN85
      WRITE (IO,150) RDPR,RFPR                                          READCN86
  150 FORMAT (//,5X,*DISPLACEMENT RATIO INCREMENT FOR PRINTING     =*,F8.READCN87
     14,//,5X,*FORCE RATIO INCREMENT FOR PRINTING           =*,F8.4,1X) READCN88
C                                                                       READCN89
C                                                                       READCN90
      READ (IN,110) LCYCLE                                              READCN91
      WRITE (IO,160) LCYCLE                                             READCN92
  160 FORMAT (//,5X,*NUMBER OF LOAD CYCLES, LCYCLE                  =*,I8,READCN93
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     11X)                                                              READCN94
C                                                                      READCN95
      WRITE (IO,10)                                                    READCN96
      WRITE (IO,10)                                                    READCN97
C                                                                      READCN98
      READ (IN,110) NREADB,KIN,KPS                                     READCN99
C                                                                      READC100
      WRITE (IO,170) NREADB,KIN,KPS                                    READC101
  170 FORMAT (//,5X,*NUMBER OF BEAMS TO BE READ IN, NREADB         =*,I8,READC102
     1//,5X,*READ ONLY FIRST ELEMENT IF KIN = 0, KIN       =*,I8,//,5X,*DREADC103
     2EAD LOAD OR PRESTRESS FOR BEAMS (0=NO), KPS =*,I8,1X)            READC104
C                                                                      READC105
      READ (IN,180) ISRT,ISRCH                                         READC106
  180 FORMAT(A3,A4)                                                    READC107
      WRITE (IO,190) ISRT,ISRCH                                        READC108
  190 FORMAT (//,5X,*COMPUTE ELEMENT STRESS USING                  =*,A3,READC109
     1A4,//)                                                           READC110
C                                                                      READC111
      ISRCH=3H NO                                                      READC112
      IF (ISRT.EQ.3HNOD) ISRCH=3HYES                                   READC113
C                                                                      READC114
C     THIS PROGRAM CAN BE EXTENDED TO CONSIDER SKEWED BRIDGES BY-      READC115
C                                                                      READC116
C         1. INPUTTING THE CORRECT SKEW ANGLE                          READC117
C                                                                      READC118
C         2. IF APPROPRIATE, SPECIFYING FIXED BC CONDITIONS IN THE SKEW READC119
C            COORDINATE SYSTEM, I.E. IVALUE = 2 RATHER THAN 1          READC120
C                                                                      READC121
C         3. SPECIFYING COORDINATE LOCATIONS AND AREAS FOR             READC122
C            DISTRIBUTED LOADS, PATCH LOADS, AND CONCENTRATED          READC123
C            LOADS IN THE SKEW COORDINATE SYSTEM                       READC124
C                                                                      READC125
C         4. SPECIFYING THE SLAB ELEMENT DIMENSIONS IN THE SKEW        READC126
C            COORDINATE SYSTEM, I.E. YSEG IN SUBROUTINE PINF           READC127
C                                                                      READC128
C         SEE F.E.L. REPORT NO. 400.20 FOR COMMENTS ON SKEW BRIDGES    READC129
C                                                                      READC130
      PHI=90.0                                                         READC131
      WRITE (IO,200) PHI                                               READC132
  200 FORMAT (1H0,//,5X,*SKEW ANGLE (DEGREES)                      =*READC133
     1,F8.3)                                                           READC134
C                                                                      READC135
C     CARTESIAN FORCE = AU*SKEW FORCE.. INPLANE                        READC136
C                                                                      READC137
      RPHI=PHI*4.*ATAN(1.)/180.                                        READC138
      AU(1,1)=1.                                                       READC139
      AU(1,2)=COS(RPHI)                                                READC140
      AU(2,1)=0.                                                       READC141
      AU(2,2)=SIN(RPHI)                                                READC142
C                                                                      READC143
C     CARTESIAN FORCE = AO*SKEW FORCE.. BENDING                        READC144
C                                                                      READC145
      AO(1,1)=1.                                                       READC146
      AO(2,1)=0.                                                       READC147
      AO(1,2)=0.                                                       READC148
      AO(2,3)=0.                                                       READC149
      AO(1,3)=0.                                                       READC150
      AO(3,1)=0.                                                       READC151
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      AO(2,2)=SIN(RPHI)                                                 READC152
      AO(3,2)=-COS(RPHI)                                                READC153
      AO(3,3)=1.                                                        READC154
C                                                                       READC155
C     CARTESIAN STRAIN = DS* SKEW STRAIN                                READC156
C                                                                       READC157
      DS(1,1)=1.                                                        READC158
      DS(1,2)=0.                                                        READC159
      DS(1,3)=0.                                                        READC160
      DS(3,2)=0.                                                        READC161
      DS(2,1)=1./(TAN(RPHI)*TAN(RPHI))                                  READC162
      DS(2,2)=1./(SIN(RPHI)*SIN(RPHI))                                  READC163
      DS(2,3)=-COS(RPHI)/(SIN(RPHI)*SIN(RPHI))                          READC164
      DS(3,1)=-2./TAN(RPHI)                                             READC165
      DS(3,3)=1./SIN(RPHI)                                              READC166
C                                                                       READC167
C                                                                       READC168
      NITERD=5                                                          READC169
C                                                                       READC170
      RRATIO=.5                                                         READC171
      RQAPA=.2                                                          READC172
      CQAPA=.1                                                          READC173
      NCHECK=3                                                          READC174
      DPFC=.1                                                           READC175
C                                                                       READC176
      TOLF=.1                                                           READC177
      TOLDSP=.20                                                        READC178
C                                                                       READC179
      FTOL=.10                                                          READC180
      CTOL=.1                                                           READC181
C                                                                       READC182
      PCTT=.90                                                          READC183
      PCTC=.60                                                          READC184
C                                                                       READC185
      NTRIAL=1                                                          READC186
      NITER=4                                                           READC187
      LITER=1                                                           READC188
      LTRIAL=1                                                          READC189
      IF (MODES.EQ.3HYES) LITER=3                                       READC190
      I=3                                                               READC191
      J=3                                                               READC192
      IF (NSIGNI(1).NE.0) NSIGNI(1)=(NSIGNI(1)-1)*5+J                   READC193
      IF (NSIGNI(2).NE.0) NSIGNI(2)=(NSIGNI(2)-1)*5+J                   READC194
C                                                                       READC195
      INOTEN=3HNO                                                       READC196
      PLTCRD=3HYES                                                      READC197
      ICMPLT=3HNO                                                       READC198
      PRECRK=3HNO                                                       READC199
      CODEA=3HNO                                                        READC200
      CODET=3HNO                                                        READC201
C                                                                       READC202
      RETURN                                                            READC203
      END                                                               READC204
      SUBROUTINE INITIA (NUMEL,NCNS,NULAY,NA1,ETXX,SXXOT,AS1,AF,AS,AFT,DINITIA 2
     1ISPLA)                                                            INITIA 3
C                                                                       INITIA 4
C     THIS SUBROUTINE INITIALIZES ARRAYS/TAPES ASSOCIATED WITH THE SLAB INITIA 5
C                                                                       INITIA 6
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      DIMENSION SXXOT(NCNS), AS1(NUMEL,NCNS), AF(NUMEL,NULAY), AS(NUMEL,INITIA 7
     1NULAY), AFT(NCNS), DISPLA(NA1), ETXX(NUMEL), DUMMY(1)                INITIA 8
C                                                                          INITIA 9
      COMMON /HIST/ NVAL(10),IVAL(10),FVAL(10)                             INITIA10
      COMMON /SEARCH/ ISRCH                                                INITIA11
      COMMON /PDIM/ PDT(70)                                                INITIA12
      COMMON /STCHK/ STRAMS(30)                                            INITIA13
      COMMON /HISTS/ NVALS(30),IVALS(60)                                   INITIA14
      COMMON /CRWB/ CRB(10)                                                INITIA15
      COMMON /CRWS/ CRS(10)                                                INITIA16
C                                                                          INITIA17
      REWIND 19                                                            INITIA18
      REWIND 21                                                            INITIA19
      REWIND 31                                                            INITIA20
      REWIND 32                                                            INITIA21
C                                                                          INITIA22
      DO 10 I=1,10                                                         INITIA23
      NVAL(I)=3H NO                                                        INITIA24
      IVAL(I)=0                                                            INITIA25
      FVAL(I)=-999.                                                        INITIA26
   10 CONTINUE                                                             INITIA27
C                                                                          INITIA28
      DO 30 N=1,NUMEL                                                      INITIA29
      ETXX(N)=0.0                                                          INITIA30
      DO 20 ML=1,NCNS                                                      INITIA31
      AS1(N,ML)=999.0                                                      INITIA32
   20 CONTINUE                                                             INITIA33
      DO 30 ML=1,NULAY                                                     INITIA34
      AF(N,ML)=999.0                                                       INITIA35
      AS(N,ML)=999.0                                                       INITIA36
   30 CONTINUE                                                             INITIA37
      DO 40 ML=1,NCNS                                                      INITIA38
      SXXOT(ML)=0.0                                                        INITIA39
      AFT(ML)=5H                                                           INITIA40
   40 CONTINUE                                                             INITIA41
      DO 50 I=1,NA1                                                        INITIA42
      DISPLA(I)=0.0                                                        INITIA43
   50 CONTINUE                                                             INITIA44
      DO 60 I=1,NUMEL                                                      INITIA45
      WRITE (19) SXXOT,SXXOT,SXXOT                                         INITIA46
      WRITE (21) SXXOT,SXXOT,SXXOT                                         INITIA47
      WRITE (32) AFT,AFT                                                   INITIA48
   60 CONTINUE                                                             INITIA49
C                                                                          INITIA50
      N=0                                                                  INITIA51
      DO 70 I=1,NUMEL                                                      INITIA52
   70 WRITE (32) N,N,N                                                     INITIA53
C                                                                          INITIA54
      WRITE (31) AS1,AF,AS                                                 INITIA55
C                                                                          INITIA56
      REWIND 18                                                            INITIA57
      WRITE (18) DISPLA,DISPLA,DISPLA                                      INITIA58
      REWIND 17                                                            INITIA59
      WRITE (17) DISPLA,DISPLA,DISPLA,ETXX,ETXX,ETXX,ETXX,ETXX,ETXX        INITIA60
      REWIND 30                                                            INITIA61
      WRITE (30) DISPLA                                                    INITIA62
C                                                                          INITIA63
      DO 80 I=1,70                                                         INITIA64
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   80 PDT(I)=-1.E+20                                                    INITIA65
C                                                                       INITIA66
      DO 90 I=1,30                                                      INITIA67
   90 STRAMS(I)=-1.0                                                    INITIA68
C                                                                       INITIA69
      DO 100 I=1,60                                                     INITIA70
  100 IVALS(I)=0                                                        INITIA71
C                                                                       INITIA72
      DO 110 I=1,30                                                     INITIA73
  110 NVALS(I)=3H NO                                                    INITIA74
C                                                                       INITIA75
      DO 120 I=1,10                                                     INITIA76
  120 CRS(I)=0.                                                         INITIA77
      DO 130 I=1,10                                                     INITIA78
  130 CRB(I)=0.                                                         INITIA79
      RETURN                                                            INITIA80
      END                                                               INITIA81
      SUBROUTINE INITIB (NBEAMX,NULAYB,NNN,SIBXXA)                      INITIB 2
C                                                                       INITIB 3
C     THIS SUBROUTINE INITIALIZES ARRAYS ASSOCIATED WITH BEAM ELEMENTS. INITIB 4
C                                                                       INITIB 5
      COMMON /BDIM/ RON(48)                                             INITIB 6
      COMMON /BTCHK/ STRAMX(30)                                         INITIB 7
      COMMON /HISTB/ NVALB(30),IVALB(60)                                INITIB 8
      DIMENSION SIBXXA(NULAYB), DUMMY(1)                                INITIB 9
      REWIND 23                                                         INITIB10
      REWIND 25                                                         INITIB11
      DO 10 ML=1,NULAYB                                                 INITIB12
      SIBXXA(ML)=0.0                                                    INITIB13
   10 CONTINUE                                                          INITIB14
      DO 20 I=1,NBEAMX                                                  INITIB15
      WRITE (23) SIBXXA                                                 INITIB16
      WRITE (25) SIBXXA                                                 INITIB17
   20 CONTINUE                                                          INITIB18
C                                                                       INITIB19
      DO 30 I=1,30                                                      INITIB20
   30 NVALB(I)=3H NO                                                    INITIB21
C                                                                       INITIB22
      DO 40 I=1,60                                                      INITIB23
   40 IVALB(I)=0                                                        INITIB24
C                                                                       INITIB25
      DO 50 I=1,48                                                      INITIB26
   50 RON(I)=-1.E+20                                                    INITIB27
C                                                                       INITIB28
      DO 60 I=1,30                                                      INITIB29
   60 STRAMX(I)=-1.                                                     INITIB30
C                                                                       INITIB31
      RETURN                                                            INITIB32
      END                                                               INITIB33
      SUBROUTINE BSCALE (RB,IFN,ISCALE,KC,DUM,NBEAMX,NULAYB,KMAT,PCTT,PCBSCALE 2
     1TC,SIBXXA,SIBXXC,ITYPE,SIGO,FT)                                   BSCALE 3
C                                                                       BSCALE 4
C     THIS SUBROUTINE FINDS THE BEAM SCALE FACTOR                       BSCALE 5
C                                                                       BSCALE 6
C     COMMON BLOCKS                                                     BSCALE 7
C                                                                       BSCALE 8
      COMMON /CB4/ IN,IC                                                BSCALE 9
      DIMENSION SIGO(KMAT), FT(KMAT), ITYPE(NULAYB), SIBXXC(NULAYB), SIBBSCALE10
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     1XXA(NULAY8), DUM(NULAY8), DUMMY(1)                                BSCALE11
C                                                                       BSCALE12
   10 CONTINUE                                                          BSCALE13
      RB=0.                                                             BSCALE14
C                                                                       BSCALE15
      REWIND 15                                                         BSCALE16
      REWIND 23                                                         BSCALE17
      REWIND 27                                                         BSCALE18
C                                                                       BSCALE19
      DO 50 N=1,NBEAMX                                                  BSCALE20
      READ (15) SIBXXA                                                  BSCALE21
      READ (23) SIBXXC                                                  BSCALE22
      READ (27) S,S,S,S,ITYPE,DUM,DUM,DUM,DUM                           BSCALE23
      DO 50 ML=1,NULAYB                                                 BSCALE24
      SIBA=SIBXXA(ML)                                                   BSCALE25
      S=SIBXXC(ML)                                                      BSCALE26
      K=ITYPE(ML)                                                       BSCALE27
C                                                                       BSCALE28
      IF (IFN.EQ.3HYES) GO TO 40                                        BSCALE29
C                                                                       BSCALE30
C     CONSIDER INITIAL STRESS WHEN SCALING                              BSCALE31
C                                                                       BSCALE32
      IF (S.GT.0.0) GO TO 20                                            BSCALE33
      RR=PCTC                                                           BSCALE34
      IF (K.GT.KC) RR=PCTT                                              BSCALE35
      D=-SIGO(K)*RR-SIBA                                                BSCALE36
      IF (D.GE.S) GO TO 60                                              BSCALE37
      RATIO=S/D                                                         BSCALE38
      GO TO 30                                                          BSCALE39
   20 CONTINUE                                                          BSCALE40
      D=FT(K)*PCTT-SIBA                                                 BSCALE41
      IF (D.LE.S) GO TO 60                                              BSCALE42
      RATIO=S/D                                                         BSCALE43
   30 IF (RATIO.GT.RB) RB=RATIO                                         BSCALE44
      GO TO 50                                                          BSCALE45
C                                                                       BSCALE46
   40 CONTINUE                                                          BSCALE47
C                                                                       BSCALE48
C     SCALING IS FINISHED/ USED FOR FINDING WHAT FORCE VECTOR TO APPLY  BSCALE49
C                                                                       BSCALE50
      RR=PCTC*SIGO(K)                                                   BSCALE51
      IF (S.GT.0.0.AND.K.LE.KC) RR=PCTT*FT(K)                           BSCALE52
      IF (K.GT.KC) RR=PCTT*SIGO(K)                                      BSCALE53
      RATIO=ABS(S/RR)                                                   BSCALE54
      IF (RATIO.GT.RB) RB=RATIO                                         BSCALE55
   50 CONTINUE                                                          BSCALE56
      IF (RB.EQ.0.0) RB=1.0E-09                                         BSCALE57
      RETURN                                                            BSCALE58
   60 CONTINUE                                                          BSCALE59
C                                                                       BSCALE60
      IFN=3HYES                                                         BSCALE61
      WRITE (IO,70)                                                     BSCALE62
   70 FORMAT (1H0,//,6X,*PCTC OR PCTT LIMITS EXCEEDED IN BSCALE*,//)    BSCALE63
      GO TO 10                                                          BSCALE64
C                                                                       BSCALE65
      END                                                               BSCALE66
      SUBROUTINE PSCALE (RATIO,IFN,ISCALE,SXXOT,SYYOT,SXYOT,PCTT,PCTC,IOPSCALE 2
     1,NCNS,NUMEL,NULAY,NSLAYR,NSMAT,SIGXXO,SIGYYO,SIGXYO,NSTYPE,SPHI,SIPSCALE 3
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     2GMAP)                                                            PSCALE 4
C                                                                      PSCALE 5
C     THIS SUBROUTINE FINDS THE PLATE SCALE FACTOR                     PSCALE 6
C                                                                      PSCALE 7
      DIMENSION SIGXXO(NCNS), SIGYYO(NCNS), SIGXYO(NCNS), SXXOT(NCNS), SPSCALE 8
     1YYOT(NCNS), SXYOT(NCNS), SPHI(NSLAYR), NSTYPE(NSLAYR), SIGMAP(NSMAPSCALE 9
     2T), DUMMY(1)                                                     PSCALE10
C                                                                      PSCALE11
      COMMON /TYPENN/ TYPE                                             PSCALE12
      COMMON /PROPC/ V(11)                                             PSCALE13
C                                                                      PSCALE14
   10 CONTINUE                                                         PSCALE15
      REWIND 19                                                        PSCALE16
      REWIND 21                                                        PSCALE17
      FC=V(3)                                                          PSCALE18
      FT=V(5)                                                          PSCALE19
C                                                                      PSCALE20
      RATIO=0.0                                                        PSCALE21
      DO 60 N=1,NUMEL                                                  PSCALE22
C                                                                      PSCALE23
      READ (19) SIGXXO,SIGYYO,SIGXYO                                   PSCALE24
      READ (21) SXXOT,SYYOT,SXYOT                                      PSCALE25
C                                                                      PSCALE26
      DO 60 ML=1,NCNS                                                  PSCALE27
      SX=SIGXXO(ML)                                                    PSCALE28
      SY=SIGYYO(ML)                                                    PSCALE29
      SXY=SIGXYO(ML)                                                   PSCALE30
      SXT=SXXOT(ML)                                                    PSCALE31
      SYT=SYYOT(ML)                                                    PSCALE32
      SXYT=SXYOT(ML)                                                   PSCALE33
      IF (ML.GT.NULAY) GO TO 20                                        PSCALE34
      CALL PRNCIP (SX,SY,SXY,S1,S2,THETA)                              PSCALE35
      CALL PRNCIP (SXT,SYT,SXYT,S1T,S2T,THETA)                         PSCALE36
      S1T=-S1T                                                         PSCALE37
      S2T=-S2T                                                         PSCALE38
C                                                                      PSCALE39
C     SET INITIAL STRESS IN SLAE TO ZERO IF SCALING IS FINISHED, USED TOPSCALE40
C         FIND THE FORCE VECTOR FOR THE INCREMENTAL SOLUTION.          PSCALE41
C                                                                      PSCALE42
      IF (IFN.EQ.3HYES) S1T=0.0                                        PSCALE43
      IF (IFN.EQ.3HYES) S2T=0.0                                        PSCALE44
C                                                                      PSCALE45
      S1=-S1                                                           PSCALE46
      S2=-S2                                                           PSCALE47
      GO TO 30                                                         PSCALE48
   20 CONTINUE                                                         PSCALE49
      ANG=SPHI(ML-NULAY)                                               PSCALE50
      CALL TRANG (SX,SY,SXY,ANG,S1,S2,S3)                              PSCALE51
      CALL TRANG (SXT,SYT,SXYT,ANG,S1T,S2T,S3T)                        PSCALE52
      M=NSTYPE(ML-NULAY)                                               PSCALE53
      SP1=SIGMAP(M)                                                    PSCALE54
      IF (S1.LT.0.0) SP1=-SP1                                          PSCALE55
      D=SP1*PCTT-S1T                                                   PSCALE56
      IF (IFN.NE.3HYES.AND.ABS(D).LE.ABS(S1)) GO TO 70                 PSCALE57
      TEMP1=S1/D                                                       PSCALE58
      GO TO 50                                                         PSCALE59
   30 CONTINUE                                                         PSCALE60
C                                                                      PSCALE61
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C     ESTIMATE FINAL STRESS STATE AFTER SCALING                          PSCALE62
C                                                                        PSCALE63
      X=S1                                                               PSCALE64
      Y=S2                                                               PSCALE65
      IF (S2.EQ.0.0) Y=1.0E-09                                           PSCALE66
      IF (S1.EQ.0.0) X=1.0E-09                                           PSCALE67
C                                                                        PSCALE68
      S1X=FC                                                             PSCALE69
      S2X=FC                                                             PSCALE70
      IF (S1.LT.0.0) S1X=-FT                                             PSCALE71
      IF (S2.LT.0.0) S2X=-FT                                             PSCALE72
C                                                                        PSCALE73
      SA=S1X                                                             PSCALE74
      SB=Y*(SA-S1T)/X+S2T                                                PSCALE75
      IF (ABS(SB).LE.(ABS(S2X)+.001)) GO TO 40                           PSCALE76
C                                                                        PSCALE77
      SB=S2X                                                             PSCALE78
      SA=X*(SB-S2T)/Y+S1T                                                PSCALE79
C                                                                        PSCALE80
   40 CONTINUE                                                           PSCALE81
C                                                                        PSCALE82
C     SCALE FACTOR IS BASED ON ESTIMATED STRESS PATH                     PSCALE83
C                                                                        PSCALE84
      CALL BAXIAL (SB,SA,ALPH2,SP2,EP2,DIRT2,EC2)                        PSCALE85
      RR=PCTC                                                            PSCALE86
      IF (TYPE.EQ.5HLINER) RR=PCTT                                       PSCALE87
      D=SP2*RR-S2T                                                       PSCALE88
      IF (IFN.NE.3HYES.AND.ABS(D).LE.ABS(S2)) GO TO 70                   PSCALE89
      TEMP2=S2/D                                                         PSCALE90
      IF (TEMP2.GT.RATIO) RATIO=TEMP2                                    PSCALE91
      CALL BAXIAL (SA,SB,ALPH1,SP1,EP1,DIRT1,EC1)                        PSCALE92
      RR=PCTC                                                            PSCALE93
      IF (TYPE.EQ.5HLINER) RR=PCTT                                       PSCALE94
      D=SP1*RR-S1T                                                       PSCALE95
      IF (IFN.NE.3HYES.AND.ABS(D).LE.ABS(S1)) GO TO 70                   PSCALE96
      TEMP1=S1/D                                                         PSCALE97
   50 IF (TEMP1.GT.RATIO) RATIO=TEMP1                                    PSCALE98
C                                                                        PSCALE99
   60 CONTINUE                                                           PSCAL100
      IF (RATIO.EQ.0.0) RATIO=1.0E-09                                    PSCAL101
      RETURN                                                             PSCAL102
   70 CONTINUE                                                           PSCAL103
C                                                                        PSCAL104
      IFN=3HYES                                                          PSCAL105
      D=-D                                                               PSCAL106
      WRITE (IO,80)                                                      PSCAL107
   80 FORMAT (1H0,//,5X,*PCTC OR PCTT LIMITS EXCEEDED IN PSCALE*,//)     PSCAL108
      WRITE (IO,90) N,ML,D                                               PSCAL109
   90 FORMAT (1H ,5X,*ELEMENT  *,I3,*  LAYER  *,I3,*   ALLOWABLE STRESS  PSCAL110
     1CHANGE OF  *,E16.9,*  HAS BEEN EXCEEDED*,//)                       PSCAL111
      GO TO 10                                                           PSCAL112
C                                                                        PSCAL113
      END                                                                PSCAL114
      SUBROUTINE BSTRAN (NIX,NULAYS,NA1,NBEAMX,EIB,CUB,DUM,DISP)         BSTRAN 2
C                                                                        BSTRAN 3
C     THIS SUBROUTINE COMPUTES THE INPLANE STRAIN AND THE BENDING        BSTRAN 4
C          CURVATURE INCREMENTS  FOR THE BEAM ELEMENTS                   BSTRAN 5
C                                                                        BSTRAN 6
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      DIMENSION DISP(NA1), EIB(NBEAMX), CUB(NBEAMX), DUM(NULAYB), DUMMY(BSTRAN 7
     11)                                                              BSTRAN 8
C                                                                     BSTRAN 9
      REWIND 27                                                       BSTRAN10
C                                                                     BSTRAN11
      DO 10 LSE=1,NBEAMX                                              BSTRAN12
C                                                                     BSTRAN13
      READ (27) XLNGTH,GKEI,NPIX,NPKX,DUM,DUM,DUM,DUM,DUM             BSTRAN14
C                                                                     BSTRAN15
C     FIND LOCATION OF NODE POINTS                                    BSTRAN16
C                                                                     BSTRAN17
      I=NPIX                                                          BSTRAN18
      K=NPKX                                                          BSTRAN19
      I=5*I                                                           BSTRAN20
      K=5*K                                                           BSTRAN21
C                                                                     BSTRAN22
C     COMPUTE INPLANE STRAINS AND CURVATURES                          BSTRAN23
C                                                                     BSTRAN24
      EIB(LSE)=(DISP(K-4)-DISP(I-4))/XLNGTH                           BSTRAN25
      CUB(LSE)=(DISP(K)-DISP(I))/XLNGTH                               BSTRAN26
   10 CONTINUE                                                        BSTRAN27
      RETURN                                                          BSTRAN28
      END                                                             BSTRAN29
      SUBROUTINE BSTRSS (PF,DUM,ZCRD,EIB,CUB,KC,NULAYB,NBEAMX,KMAT,SIBXXBSTRSS 2
     1A,SIBXXC,ESX,RON,ROM,SIGO,FT,RONT,ROMT,ITYPE)                   BSTRSS 3
C                                                                     BSTRSS 4
C     THIS SUBROUTINE COMPUTES THE STESS INCREMENTS                   BSTRSS 5
C         AND THE PRESCAN FACTOR                                      BSTRSS 6
C                                                                     BSTRSS 7
C                                                                     BSTRSS 8
      DIMENSION ESX(NULAYB,NBEAMX), RON(KMAT), ROM(KMAT), SIGO(KMAT), FTBSTRSS 9
     1(KMAT), RONT(KC), ROMT(KC), SIBXXA(NULAYB), SIBXXC(NULAYB), ITYPE(BSTRSS10
     2NULAYB), ZCRD(NULAYB), EIB(NBEAMX), CUB(NBEAMX), DUM(NULAYB), DUMMBSTRSS11
     3Y(1)                                                            BSTRSS12
      COMMON /CB309/ FTOL,CTOL                                        BSTRSS13
C                                                                     BSTRSS14
C                                                                     BSTRSS15
      REWIND 5                                                        BSTRSS16
      REWIND 15                                                       BSTRSS17
      REWIND 23                                                       BSTRSS18
      REWIND 27                                                       BSTRSS19
C                                                                     BSTRSS20
      DO 40 N=1,NBEAMX                                                BSTRSS21
C                                                                     BSTRSS22
      READ (15) SIBXXA                                                BSTRSS23
      READ (23) SIBXXC                                                BSTRSS24
      READ (27) XLNGTH,GKEI,NPIX,NPKX,ITYPE,DUM,DUM,ZCRD,DUM          BSTRSS25
C                                                                     BSTRSS26
      DO 30 ML=1,NULAYB                                               BSTRSS27
C                                                                     BSTRSS28
C                                                                     BSTRSS29
      ES=ESX(ML,N)                                                    BSTRSS30
      SIBA=SIBXXA(ML)                                                 BSTRSS31
      SIBC=SIBXXC(ML)                                                 BSTRSS32
      ZCR=ZCRD(ML)                                                    BSTRSS33
      EPSXBT=EIB(N)+CUB(N)*ZCR                                        BSTRSS34
      S=SIBA+SIBC                                                     BSTRSS35
      K=ITYPE(ML)                                                     BSTRSS36
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C                                                                       BSTRSS37
C     FIND MODULUS                                                      BSTRSS38
C                                                                       BSTRSS39
      IF (ES.EQ.0.0) GO TO 30                                           BSTRSS40
C                                                                       BSTRSS41
      ZESX=ES/(1.0+RON(K)*(1.0-ROM(K))/ROM(K)*((ABS(S)/SIGO(K))**(RON(K)BSTRSS42
     1-1.)))                                                            BSTRSS43
C                                                                       BSTRSS44
      IF (S.GT.0.0.AND.K.LE.KC) ZESX=ES/(1.+RONT(K)*(1.-ROMT(K))/ROMT(K)BSTRSS45
     1*((ABS(S)/FT(K))**(RONT(K)-1.)))                                  BSTRSS46
C                                                                       BSTRSS47
      IF (K.GT.KC) GO TO 10                                             BSTRSS48
C                                                                       BSTRSS49
C     CHECK LAYER FAILURE                                               BSTRSS50
C                                                                       BSTRSS51
      SP=-SIGO(K)                                                       BSTRSS52
      IF (S.GT.0.) SP=FT(K)                                             BSTRSS53
      IF (ABS(S).GT.ABS(SP)) ZESX=0.0                                   BSTRSS54
   10 CONTINUE                                                          BSTRSS55
C                                                                       BSTRSS56
C     FIND PRESCAN FACTOR                                               BSTRSS57
C                                                                       BSTRSS58
      SIBC=EPSXBT*ZESX                                                  BSTRSS59
      SIBXXC(ML)=SIBC                                                   BSTRSS60
      S=SIBC+SIBA                                                       BSTRSS61
      SP=-SIGO(K)                                                       BSTRSS62
      IF (S.GT.0.) SP=FT(K)                                             BSTRSS63
      IF (ABS(S).LT.ABS(SP)) GO TO 30                                   BSTRSS64
      IF (K.GT.KC) GO TO 30                                             BSTRSS65
      IF (ABS(S-SIBA).LT.1.0E-06) GO TO 20                              BSTRSS66
      ELOW=-SIGO(K)*(1.-CTOL/2.)                                        BSTRSS67
      IF (S.GT.0.) ELOW=FT(K)*(1.-FTOL/2.)                              BSTRSS68
      TEMP=ABS((ELOW-SIBA)/(S-SIBA))                                    BSTRSS69
      IF (TEMP.LT.PF) PF=TEMP                                           BSTRSS70
      GO TO 30                                                          BSTRSS71
   20 CONTINUE                                                          BSTRSS72
      PF=0.0                                                            BSTRSS73
   30 CONTINUE                                                          BSTRSS74
      WRITE (5) SIBXXC                                                  BSTRSS75
   40 CONTINUE                                                          BSTRSS76
      REWIND 23                                                         BSTRSS77
      REWIND 5                                                          BSTRSS78
      CALL FTNCOPY (4LJUM5,3LJ23,0)                                     BSTRSS79
      RETURN                                                            BSTRSS80
      END                                                               BSTRSS81
      SUBROUTINE PSTRAN (NUMEL,NA1,NANA,NULAY,CUXX,CUYY,CUXY,EIXX,EIYY,EPSTRAN 2
     1IXY,DISP,PDT,PZC,SZC,AFT,AST,NSLAYR)                              PSTRAN 3
C                                                                       PSTRAN 4
C     THIS SUBROUTINE COMPUTES THE INPLANE STRAINS AND CURVATURES       PSTRAN 5
C         FOR THE SLAB                                                  PSTRAN 6
C                                                                       PSTRAN 7
      DIMENSION CUXX(NUMEL), CUYY(NUMEL), CUXY(NUMEL), EIXX(NUMEL), EIYYPSTRAN 8
     1(NUMEL), EIXY(NUMEL), DISP(NA1), PDT(NULAY), PZC(NULAY), CURV(3), PSTRAN 9
     288(3,12), DPV(12)                                                 PSTRAN10
      DIMENSION EUT(3), DPUT(8), CURVT(3), DPVT(12)                     PSTRAN11
      DIMENSION AST(NULAY), AFT(NULAY), SZC(NSLAYR)                     PSTRAN12
      DIMENSION BU(3,8), EE(3), ECUR(3), IXP(5), IYP(5), NODE(5), DPU(8)PSTRAN13
C                                                                       PSTRAN14
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      COMMON /SKEW/ PHI,AU(2,2),AO(3,3),DS(3,3)                         PSTRAN15
      COMMON /SEARCH/ ISRCH,ISRT                                        PSTRAN16
C                                                                       PSTRAN17
      DATA (IXP(I),I=1,5)/-1,-1,1,1,0/                                  PSTRAN18
      DATA (IYP(I),I=1,5)/1,-1,1,-1,0/                                  PSTRAN19
C                                                                       PSTRAN20
C     POSITION TAPE                                                     PSTRAN21
C                                                                       PSTRAN22
      REWIND 32                                                         PSTRAN23
      DO 10 I=1,NUMEL                                                   PSTRAN24
   10 READ (32) AFT,AST                                                 PSTRAN25
C                                                                       PSTRAN26
      REWIND 28                                                         PSTRAN27
C                                                                       PSTRAN28
      DO 310 N=1,NUMEL                                                  PSTRAN29
      READ (28) DT,ELLA,ELLE,NPI,NPJ,NPK,NPL                            PSTRAN30
C                                                                       PSTRAN31
      NODE(1)=NPI                                                       PSTRAN32
      NODE(2)=NPJ                                                       PSTRAN33
      NODE(3)=NPK                                                       PSTRAN34
      NODE(4)=NPL                                                       PSTRAN35
      NODE(5)=0                                                         PSTRAN36
C                                                                       PSTRAN37
C     GET THE BENDING DISP                                              PSTRAN38
C                                                                       PSTRAN39
      I=NPI*5-3                                                         PSTRAN40
      J=NPJ*5-3                                                         PSTRAN41
      K=NPK*5-3                                                         PSTRAN42
      L=NPL*5-3                                                         PSTRAN43
      DO 20 II=1,3                                                      PSTRAN44
      DPV(II)=DISP(I+II)                                                PSTRAN45
      DPV(II+3)=DISP(J+II)                                              PSTRAN46
      DPV(II+6)=DISP(K+II)                                              PSTRAN47
   20 DPV(II+9)=DISP(L+II)                                              PSTRAN48
C                                                                       PSTRAN49
C     GET THE INPLANE DISP                                              PSTRAN50
C                                                                       PSTRAN51
      I=I-2                                                             PSTRAN52
      J=J-2                                                             PSTRAN53
      K=K-2                                                             PSTRAN54
      L=L-2                                                             PSTRAN55
C                                                                       PSTRAN56
      DO 30 II=1,2                                                      PSTRAN57
      DPU(II)=DISP(I+II)                                                PSTRAN58
      DPU(II+2)=DISP(J+II)                                              PSTRAN59
      DPU(II+4)=DISP(K+II)                                              PSTRAN60
      DPU(II+6)=DISP(L+II)                                              PSTRAN61
   30 CONTINUE                                                          PSTRAN62
C                                                                       PSTRAN63
      IF (ABS(PHI).EQ.90.) GO TO 100                                    PSTRAN64
C                                                                       PSTRAN65
C     GET THE SKEW DISPLACEMENTS                                        PSTRAN66
C                                                                       PSTRAN67
      DO 50 II=1,12,3                                                   PSTRAN68
      DO 50 I=1,3                                                       PSTRAN69
      SUM=0.                                                            PSTRAN70
C                                                                       PSTRAN71
C     SKEW DISP = AO**T *CARTESIAN DISP                                 PSTRAN72
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C                                                                       PSTRAN73
      DO 40 L=1,3                                                       PSTRAN74
   40 SUM=SUM+AO(L,I)*DPV(II+L-1)                                       PSTRAN75
C                                                                       PSTRAN76
   50 DPVT(II+I-1)=SUM                                                  PSTRAN77
C                                                                       PSTRAN78
      DO 60 I=1,12                                                      PSTRAN79
   60 DPV(I)=DPVT(I)                                                    PSTRAN80
C                                                                       PSTRAN81
C                                                                       PSTRAN82
C     GET THE SKEW DISPLACEMENTS                                        PSTRAN83
C                                                                       PSTRAN84
      DO 80 II=1,8,2                                                    PSTRAN85
      DO 80 I=1,2                                                       PSTRAN86
      SUM=0.                                                            PSTRAN87
C                                                                       PSTRAN88
C     SKEW DISP = AU**T *CARTESIAN DISP                                 PSTRAN89
C                                                                       PSTRAN90
      DO 70 L=1,2                                                       PSTRAN91
   70 SUM=SUM+AU(L,I)*DPU(II+L-1)                                       PSTRAN92
C                                                                       PSTRAN93
   80 DPUT(II+I-1)=SUM                                                  PSTRAN94
C                                                                       PSTRAN95
      DO 90 I=1,8                                                       PSTRAN96
   90 DPU(I)=DPUT(I)                                                    PSTRAN97
  100 CONTINUE                                                          PSTRAN98
      EMAXT=-999.0                                                      PSTRAN99
      INODET=0                                                          PSTRA100
      III=1                                                             PSTRA101
      IF (ISRCH.EQ.3HYES) III=5                                         PSTRA102
C                                                                       PSTRA103
C     LOOK AT ALL NODES OF ELEMENT N                                    PSTRA104
C                                                                       PSTRA105
      DO 290 II=1,III                                                   PSTRA106
      IF (ISRT.EQ.3HAVE) GO TO 110                                      PSTRA107
C                                                                       PSTRA108
C     FIND NODE POSITION                                                PSTRA109
C                                                                       PSTRA110
      IX=IXP(II)                                                        PSTRA111
      IY=IYP(II)                                                        PSTRA112
      IF (ISRCH.NE.3HYES) READ (32) ML,IX,IY                            PSTRA113
      X=IX                                                              PSTRA114
      Y=IY                                                              PSTRA115
C                                                                       PSTRA116
C     SET UP BB MATRIX TO FIND CURVATURES                               PSTRA117
C                                                                       PSTRA118
C                                                                       PSTRA119
      A=6.*X                                                            PSTRA120
      B=6.*Y*X                                                          PSTRA121
      C=2.*Y                                                            PSTRA122
      AA=ELLA*ELLA                                                      PSTRA123
      BB(1,1)=(-A-B)/AA                                                 PSTRA124
      BB(1,2)=0.                                                        PSTRA125
      BB(1,3)=(A-2.-C+B)/ELLA                                           PSTRA126
      BB(1,4)=(-A+B)/AA                                                 PSTRA127
      BB(1,5)=0.                                                        PSTRA128
      BB(1,6)=(A-2.+C-B)/ELLA                                           PSTRA129
      BB(1,7)=(A+B)/AA                                                  PSTRA130
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      BB(1,8)=0.                                                        PSTRA131
      BB(1,9)=(A+2.+C+B)/ELLA                                           PSTRA132
      BB(1,10)=(A-B)/AA                                                 PSTRA133
      BB(1,11)=0.                                                       PSTRA134
      BB(1,12)=(A+2.-C-B)/ELLA                                          PSTRA135
C                                                                       PSTRA136
      A=2.*X                                                            PSTRA137
      B=6.*Y                                                            PSTRA138
      C=6.*X*Y                                                          PSTRA139
      AA=ELLB*ELLB                                                      PSTRA140
      BB(2,1)=(B-C)/AA                                                  PSTRA141
      BB(2,2)=(-2.+A-B+C)/ELLB                                          PSTRA142
      BB(2,3)=0.                                                        PSTRA143
      BB(2,4)=(-B+C)/AA                                                 PSTRA144
      BB(2,5)=(2.-A-B+C)/ELLB                                           PSTRA145
      BB(2,6)=0.                                                        PSTRA146
      BB(2,7)=(B+C)/AA                                                  PSTRA147
      BB(2,8)=(-2.-A-B-C)/ELLB                                          PSTRA148
      BB(2,9)=0.                                                        PSTRA149
      BB(2,10)=(-B-C)/AA                                                PSTRA150
      BB(2,11)=(2.+A-B-C)/ELLB                                          PSTRA151
      BB(2,12)=0.                                                       PSTRA152
C                                                                       PSTRA153
      A=4.*X                                                            PSTRA154
      B=4.*Y                                                            PSTRA155
      C=6.*X*X                                                          PSTRA156
      D=6.*Y*Y                                                          PSTRA157
      AA=ELLA*ELLB                                                      PSTRA158
      BB(3,1)=(8.-C-D)/AA                                               PSTRA159
      BB(3,2)=(-2.+B+D)/ELLA                                            PSTRA160
      BB(3,3)=(-2.-A+C)/ELLB                                            PSTRA161
      BB(3,4)=(-8.+C+D)/AA                                              PSTRA162
      BB(3,5)=(-2.-B+D)/ELLA                                            PSTRA163
      BB(3,6)=(2.+A-C)/ELLB                                             PSTRA164
      BB(3,7)=(-8.+C+D)/AA                                              PSTRA165
      BB(3,8)=(2.-B-D)/ELLA                                             PSTRA166
      BB(3,9)=(-2.+A+C)/ELLB                                            PSTRA167
      BB(3,10)=(8.-C-D)/AA                                              PSTRA168
      BB(3,11)=(2.+B-D)/ELLA                                            PSTRA169
      BB(3,12)=(2.-A-C)/ELLB                                            PSTRA170
C                                                                       PSTRA171
C                                                                       PSTRA172
C     SET UP BU MATRIX TO FIND INPLANE STRAINS                          PSTRA173
C                                                                       PSTRA174
      X=ELLA*X                                                          PSTRA175
      Y=ELLB*Y                                                          PSTRA176
C                                                                       PSTRA177
      A=ELLB+Y                                                          PSTRA178
      B=ELLB-Y                                                          PSTRA179
      BU(1,1)=-A                                                        PSTRA180
      BU(1,2)=0.                                                        PSTRA181
      BU(1,3)=-B                                                        PSTRA182
      BU(1,4)=0.                                                        PSTRA183
      BU(1,5)=A                                                         PSTRA184
      BU(1,6)=0.                                                        PSTRA185
      BU(1,7)=B                                                         PSTRA186
      BU(1,8)=0.                                                        PSTRA187
C                                                                       PSTRA188
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      C=ELLA+X                                                          PSTRA189
      D=ELLA-X                                                          PSTRA190
      BU(2,1)=0.                                                        PSTRA191
      BU(2,2)=D                                                         PSTRA192
      BU(2,3)=0.                                                        PSTRA193
      BU(2,4)=-D                                                        PSTRA194
      BU(2,5)=0.                                                        PSTRA195
      BU(2,6)=C                                                         PSTRA196
      BU(2,7)=0.                                                        PSTRA197
      BU(2,8)=-C                                                        PSTRA198
C                                                                       PSTRA199
      BU(3,1)=D                                                         PSTRA200
      BU(3,2)=-A                                                        PSTRA201
      BU(3,3)=-D                                                        PSTRA202
      BU(3,4)=-B                                                        PSTRA203
      BU(3,5)=C                                                         PSTRA204
      BU(3,6)=A                                                         PSTRA205
      BU(3,7)=-C                                                        PSTRA206
      BU(3,8)=B                                                         PSTRA207
C                                                                       PSTRA208
      GO TO 130                                                         PSTRA209
C                                                                       PSTRA210
  110 CONTINUE                                                          PSTRA211
C                                                                       PSTRA212
C     COMPUTE STRAIN BASED ON INTEGRATED AVERAGE                        PSTRA213
C                                                                       PSTRA214
C     SET UP BB MATRIX TO FIND CURVATURES                               PSTRA215
C                                                                       PSTRA216
      A=2./ELLA                                                         PSTRA217
      B=2./ELLB                                                         PSTRA218
      C=4./(ELLA*ELLB)                                                  PSTRA219
C                                                                       PSTRA220
      DO 120 I=1,3                                                      PSTRA221
      DO 120 J=1,12                                                     PSTRA222
  120 BB(I,J)=0.                                                        PSTRA223
      BB(1,3)=-A                                                        PSTRA224
      BB(1,6)=-A                                                        PSTRA225
      BB(1,9)=A                                                         PSTRA226
      BB(1,12)=A                                                        PSTRA227
      BB(2,2)=-B                                                        PSTRA228
      BB(2,8)=-B                                                        PSTRA229
      BB(2,5)=B                                                         PSTRA230
      BB(2,11)=B                                                        PSTRA231
      BB(3,1)=C                                                         PSTRA232
      BB(3,10)=C                                                        PSTRA233
      BB(3,4)=-C                                                        PSTRA234
      BB(3,7)=-C                                                        PSTRA235
C                                                                       PSTRA236
C     SET UP BU MATRIX TO FIND INPLANE STRAINS                          PSTRA237
C                                                                       PSTRA238
      A=ELLA                                                            PSTRA239
      B=ELLB                                                            PSTRA240
      BU(1,1)=-B                                                        PSTRA241
      BU(1,3)=-B                                                        PSTRA242
      BU(3,2)=-B                                                        PSTRA243
      BU(3,4)=-B                                                        PSTRA244
      BU(1,5)=B                                                         PSTRA245
      BU(1,7)=B                                                         PSTRA246
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      BU(3,6)=B                                                          PSTRA247
      BU(3,8)=B                                                          PSTRA248
      BU(2,2)=A                                                          PSTRA249
      BU(2,6)=A                                                          PSTRA250
      BU(3,1)=A                                                          PSTRA251
      BU(3,5)=A                                                          PSTRA252
      BU(2,4)=-A                                                         PSTRA253
      BU(2,8)=-A                                                         PSTRA254
      BU(3,3)=-A                                                         PSTRA255
      BU(3,7)=-A                                                         PSTRA256
      BU(1,2)=0.                                                         PSTRA257
      BU(1,4)=0.                                                         PSTRA258
      BU(1,6)=0.                                                         PSTRA259
      BU(1,8)=0.                                                         PSTRA260
      BU(2,1)=0.                                                         PSTRA261
      BU(2,3)=0.                                                         PSTRA262
      BU(2,5)=0.                                                         PSTRA263
      BU(2,7)=0.                                                         PSTRA264
C                                                                        PSTRA265
  130 CONTINUE                                                           PSTRA266
C                                                                        PSTRA267
      DO 150 I=1,3                                                       PSTRA268
      DO 140 J=1,12                                                      PSTRA269
  140 BB(I,J)=BB(I,J)/8.                                                 PSTRA270
C                                                                        PSTRA271
      DO 150 J=1,8                                                       PSTRA272
  150 BU(I,J)=BU(I,J)/(4.*ELLA*ELLB)                                     PSTRA273
C                                                                        PSTRA274
C                                                                        PSTRA275
      DO 170 I=1,3                                                       PSTRA276
      SUM=0.0                                                            PSTRA277
      DO 160 K=1,12                                                      PSTRA278
  160 SUM=SUM+BB(I,K)*DPV(K)                                             PSTRA279
  170 CURV(I)=SUM                                                        PSTRA280
C                                                                        PSTRA281
C     COMPUTE THE INPLANE STRAINS                                        PSTRA282
C                                                                        PSTRA283
      ABAR=(PZC(1)-PDT(1)/2.0+PZC(NULAY)+PDT(NULAY)/2.0)                 PSTRA284
      ABAR=ABAR*DT/2.0                                                   PSTRA285
C                                                                        PSTRA286
      DO 190 I=1,3                                                       PSTRA287
      SUM=0.                                                             PSTRA288
      DO 180 K=1,8                                                       PSTRA289
  180 SUM=SUM+BU(I,K)*DPU(K)                                             PSTRA290
  190 EE(I)=SUM                                                          PSTRA291
C                                                                        PSTRA292
      IF (ABS(ABAR).LE.1.0E-03) GO TO 220                                PSTRA293
      DO 210 I=1,3                                                       PSTRA294
      SUM=0.                                                             PSTRA295
      XJ=0.                                                              PSTRA296
      DO 200 K=1,8                                                       PSTRA297
      J=XJ                                                               PSTRA298
      SUM=SUM+BU(I,K)*(-1.0)**(K+1)*ABAR*DPV(3*K-(K/2)*4+J)              PSTRA299
      XJ=XJ+.5                                                           PSTRA300
  200 CONTINUE                                                           PSTRA301
  210 EE(I)=EE(I)+SUM                                                    PSTRA302
  220 CONTINUE                                                           PSTRA303
C                                                                        PSTRA304
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C      TRANSFORM STRAINS AND CURVATURES TO CARTESIAN                    PSTRA305
C                                                                       PSTRA306
       IF (ABS(PHI).EQ.90.) GO TO 260                                   PSTRA307
       DO 240 I=1,3                                                     PSTRA308
       SUM=0.                                                           PSTRA309
       SUMC=0.                                                          PSTRA310
       DO 230 L=1,3                                                     PSTRA311
       SUMC=SUMC+DS(I,L)*EE(L)                                          PSTRA312
  230  SUM=SUM+DS(I,L)*CURV(L)                                          PSTRA313
       EUT(I)=SUMC                                                      PSTRA314
  240  CURVT(I)=SUM                                                     PSTRA315
       DO 250 I=1,3                                                     PSTRA316
       EE(I)=EUT(I)                                                     PSTRA317
  250  CURV(I)=CURVT(I)                                                 PSTRA318
  260  CONTINUE                                                         PSTRA319
C                                                                       PSTRA320
C                                                                       PSTRA321
       IF (ISRCH.NE.3HYES) GO TO 290                                    PSTRA322
C                                                                       PSTRA323
C      LOOK AT TOP AND BOTTOM CONCRETE LAYERS                           PSTRA324
C                                                                       PSTRA325
       DO 280 JJ=1,2                                                    PSTRA326
       ML=NULAY                                                         PSTRA327
       IF (JJ.EQ.1) ML=1                                                PSTRA328
       CALL STRANO (N,ML,CURV,ECUR,NULAY,NUMEL,NSLAYR,PZC,PDT,DT,SZC)   PSTRA329
C                                                                       PSTRA330
C      GET TOTAL STRAIN                                                 PSTRA331
C                                                                       PSTRA332
       DO 270 I=1,3                                                     PSTRA333
  270  ECUR(I)=EE(I)+ECUR(I)                                            PSTRA334
       ECUR(3)=ECUR(3)/2.                                               PSTRA335
C                                                                       PSTRA336
       CALL PRNCIP (ECUR(1),ECUR(2),ECUR(3),E1,E2,THETA)                PSTRA337
C                                                                       PSTRA338
C      GET MAX + STRAIN                                                 PSTRA339
C                                                                       PSTRA340
       IF (E2.GT.E1) E1=E2                                              PSTRA341
       IF (E1.LT.EMAXT) GO TO 280                                       PSTRA342
       EMAXT=E1                                                         PSTRA343
       INODET=II                                                        PSTRA344
C                                                                       PSTRA345
C      GO TO ANOTHER LAYER                                              PSTRA346
C                                                                       PSTRA347
  280  CONTINUE                                                         PSTRA348
C                                                                       PSTRA349
C      GO TO ANOTHER NODE                                               PSTRA350
C                                                                       PSTRA351
  290  CONTINUE                                                         PSTRA352
C                                                                       PSTRA353
       IF (ISRCH.NE.3HYES) GO TO 300                                    PSTRA354
       WRITE (32) NODE(INODET),IXP(INODET),IYP(INODET)                  PSTRA355
       GO TO 310                                                        PSTRA356
C                                                                       PSTRA357
  300  CONTINUE                                                         PSTRA358
C                                                                       PSTRA359
C      ASSIGN ELEMENT STRAINS                                           PSTRA360
C                                                                       PSTRA361
       CUXX(N)=CURV(1)                                                  PSTRA362
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      CUYY(N)=CURV(2)                                                   PSTRA363
      CUXY(N)=CURV(3)                                                   PSTRA364
C                                                                       PSTRA365
      EIXX(N)=EE(1)                                                     PSTRA366
      EIYY(N)=EE(2)                                                     PSTRA367
      EIXY(N)=EE(3)                                                     PSTRA368
C.                                                                      PSTRA369
C     GO TO ANOTHER ELEMENT                                             PSTRA370
C                                                                       PSTRA371
  310 CONTINUE                                                          PSTRA372
      RETURN                                                            PSTRA373
      END                                                               PSTRA374
      SUBROUTINE PSTRSS (ICON,PF,NUMEL,NCNS,NULAY,NSLAYR,NSMAT,SIGXXO,SIPSTRSS 2
     1GYYO,SIGXYO,CUXX,CUYY,CUXY,EIXX,EIYY,EIXY,PZC,PDT,DT,SZC,SXXOT,SYYPSTRSS 3
     2OT,SXYOT,AS1,AF,AS,SEMOD,SIGMAP,SPROM,SPRON,NSTYPE,SPHI)          PSTRSS 4
C                                                                       PSTRSS 5
C     THIS SUBROUTINE COMPUTES THE SLAB LAYER STRESS INCREMENTS         PSTRSS 6
C        AND CALLS PDMAT TO GET THE PRESCAN FACTOR                      PSTRSS 7
C        IF ICON = 2                                                    PSTRSS 8
C                                                                       PSTRSS 9
      DIMENSION SIGXXC(NCNS), SIGYYO(NCNS), SIGXYO(NCNS), SXXOT(NCNS), SPSTRSS10
     1YYOT(NCNS), SXYOT(NCNS), CUXX(NUMEL), CUYY(NUMEL), CUXY(NUMEL), EIPSTRSS11
     2XX(NUMEL), EIYY(NUMEL), EIXY(NUMEL), EE(3), SS(3), DDD(3,3), CT(3)PSTRSS12
C                                                                       PSTRSS13
C                                                                       PSTRSS14
      IF (ICON.NE.2) REWIND 28                                          PSTRSS15
      REWIND 19                                                         PSTRSS16
      REWIND 21                                                         PSTRSS17
      IF (ICON.NE.2) REWIND 5                                           PSTRSS18
C                                                                       PSTRSS19
C                                                                       PSTRSS20
      DO 70 N=1,NUMEL                                                   PSTRSS21
      IF (ICON.NE.2) READ (28) DT,A,A,A,A,A,A                           PSTRSS22
      READ (19) SIGXXO,SIGYYO,SIGXYO                                    PSTRSS23
      READ (21) SXXOT,SYYOT,SXYOT                                       PSTRSS24
      IF (ICON.EQ.2) GO TO 10                                           PSTRSS25
      CT(1)=CUXX(N)                                                     PSTRSS26
      CT(2)=CUYY(N)                                                     PSTRSS27
      CT(3)=CUXY(N)                                                     PSTRSS28
   10 CONTINUE                                                          PSTRSS29
      DO 50 ML=1,NCNS                                                   PSTRSS30
      IF (ICON.EQ.2) GO TO 20                                           PSTRSS31
      CALL STRANO (N,ML,CT,EE,NULAY,NUMEL,NSLAYR,PZC,PDT,DT,SZC)        PSTRSS32
      EE(1)=EE(1)+EIXX(N)                                               PSTRSS33
      EE(2)=EE(2)+EIYY(N)                                               PSTRSS34
      EE(3)=EE(3)+EIXY(N)                                               PSTRSS35
   20 CONTINUE                                                          PSTRSS36
      XXOT=SXXOT(ML)                                                    PSTRSS37
      YYOT=SYYOT(ML)                                                    PSTRSS38
      XYOT=SXYOT(ML)                                                    PSTRSS39
      SIGXX=SIGXXO(ML)                                                  PSTRSS40
      SIGYY=SIGYYO(ML)                                                  PSTRSS41
      SIGXY=SIGXYO(ML)                                                  PSTRSS42
C                                                                       PSTRSS43
C     FIND ELASTICITY RELATIONSHIP / PRESCAN FACTOR                     PSTRSS44
C                                                                       PSTRSS45
      CALL PDMAT (N,ML,DDD,ICON,PF,NUMEL,NCNS,NSMAT,NULAY,NSLAYR,XXOT,YYPSTRSS46
     1OT,XYOT,SIGXX,SIGYY,SIGXY,AS1,AF,AS,SEMOD,SIGMAP,SPRON,SPRON,NSTYPPSTRSS47
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     2E,SPHI)                                                          PSTRSS48
      IF (ICON.EQ.2) GO TO 50                                          PSTRSS49
C                                                                      PSTRSS50
C     FIND STRESS INCREMENT                                            PSTRSS51
C                                                                      PSTRSS52
      DO 40 I=1,3                                                      PSTRSS53
      SUM=0.                                                           PSTRSS54
      DO 30 K=1,3                                                      PSTRSS55
   30 SUM=SUM+DDD(I,K)*EE(K)                                           PSTRSS56
   40 SS(I)=SUM                                                        PSTRSS57
      SIGXXO(ML)=SS(1)                                                 PSTRSS58
      SIGYYO(ML)=SS(2)                                                 PSTRSS59
      SIGXYO(ML)=SS(3)                                                 PSTRSS60
C                                                                      PSTRSS61
   50 CONTINUE                                                         PSTRSS62
      IF (ICON.EQ.2) GO TO 60                                          PSTRSS63
      WRITE (5) SIGXXO,SIGYYO,SIGXYO                                   PSTRSS64
   60 CONTINUE                                                         PSTRSS65
   70 CONTINUE                                                         PSTRSS66
      IF (ICON.EQ.2) RETURN                                            PSTRSS67
      REWIND 5                                                         PSTRSS68
      REWIND 19                                                        PSTRSS69
      CALL FTNCOPY (4LJUM5,3LJ19,0)                                    PSTRSS70
      RETURN                                                           PSTRSS71
      END                                                              PSTRSS72
      SUBROUTINE PDMAT (N,ML,DDD,ICON,PF,NUMEL,NCNS,NSMAT,NULAY,NSLAYR,SPDMAT  2
     1XXOT,SYYOT,SXYOT,SIGXXO,SIGYYO,SIGXYO,AS1,AF,AS,SEMOD,SIGMAP,SPROMPDMAT  3
     2,SPRON,NSTYPE,SPHI)                                              PDMAT  4
C                                                                      PDMAT  5
C     THIS SUBROUTINE FINDS THE CONSITUTIVE STRESS-STRAIN RELATION     PDMAT  6
C          OR PRESCAN FACTOR FOR THE SLAB LAYERS                       PDMAT  7
C                                                                      PDMAT  8
      DIMENSION AS1(NUMEL,NCNS), AF(NUMEL,NULAY), AS(NUMEL,NULAY), NSTYPPDMAT  9
     1E(NSLAYR), SPHI(NSLAYR), SEMOD(NSMAT), SIGMAP(NSMAT), SPRON(NSMAT)PDMAT 10
     2, SPROM(NSMAT), DD(3,3), DDD(3,3)                                PDMAT 11
      COMMON /PROPC/ V,EC,FC,ECOMP,FT,ET,PCOMP,ALMM,SALMM,EALMM,ALICC  PDMAT 12
      COMMON /TFAIL/ TOLF                                              PDMAT 13
      COMMON /COMPLT/ ICMPLT                                           PDMAT 14
      DO 10 I=1,3                                                      PDMAT 15
      DO 10 J=1,3                                                      PDMAT 16
      DDD(I,J)=0.                                                      PDMAT 17
   10 DD(I,J)=0.0                                                      PDMAT 18
      ALPH1 = 0.                                                       PDMAT 19
      ALPH2 = 0.                                                       PDMAT 20
      EC1=0.                                                           PDMAT 21
      EC2=0.                                                           PDMAT 22
C                                                                      PDMAT 23
C     CURRENT TOTAL STRESS LEVEL                                       PDMAT 24
C                                                                      PDMAT 25
      SX=SXXOT+SIGXXO                                                  PDMAT 26
      SY=SYYOT+SIGYYO                                                  PDMAT 27
      SXY=SXYOT+SIGXYO                                                 PDMAT 28
      IF (ML.GT.NULAY) GO TO 120                                       PDMAT 29
C                                                                      PDMAT 30
C     CHECK FOR LAYER FAILURE                                          PDMAT 31
      IF (AS1(N,ML).NE.999.0) GO TO 20                                 PDMAT 32
      GO TO 70                                                         PDMAT 33
   20 CONTINUE                                                         PDMAT 34
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C                                                                       PDMAT 35
C     A LAYER HAS CRACKED OR CRUSHED                                    PDMAT 36
C                                                                       PDMAT 37
C     CHECK IF THERE ARE TWO CRACKED - CRUSHED LINES                    PDMAT 38
C                                                                       PDMAT 39
      IF (AS(N,ML).NE.999.0) GO TO 170                                  PDMAT 40
C                                                                       PDMAT 41
C     FIND TRANSFORMATION ANGLE                                         PDMAT 42
C                                                                       PDMAT 43
      ANG=AS1(N,ML)                                                     PDMAT 44
      ANGF=AF(N,ML)                                                     PDMAT 45
      THETAS=ANG                                                        PDMAT 46
C                                                                       PDMAT 47
C     TRANSFORM STRESSES AND STRAINS TO CRACKED AXIS                    PDMAT 48
C                                                                       PDMAT 49
      CALL TRANG (SX,SY,SXY,ANG,S1,S2,S3)                               PDMAT 50
      CALL TRANG (SXXOT,SYYOT,SXYOT,ANG,SOT1,SOT2,SOT3)                 PDMAT 51
C                                                                       PDMAT 52
C     CHANGE SIGN                                                       PDMAT 53
C     CONSIDER 2 DIRECTION AS DIRECTION OF INTEREST                     PDMAT 54
C                                                                       PDMAT 55
      S1=-S1                                                            PDMAT 56
      S2=-S2                                                            PDMAT 57
      SOT1=-SOT1                                                        PDMAT 58
      SOT2=-SOT2                                                        PDMAT 59
C                                                                       PDMAT 60
      IF (ANG.EQ.ANGF) GO TO 30                                         PDMAT 61
C                                                                       PDMAT 62
      CALL BAXIAL (S2,S1,ALPH2,SP2,EP2,DIRT2,EC2)                       PDMAT 63
      SOT=SOT2                                                          PDMAT 64
      SP=SP2                                                            PDMAT 65
      SCT=S2                                                            PDMAT 66
      IF (ABS(S2).GE.ABS(SP)) EC2=0.0                                   PDMAT 67
      DIRECT=DIRT2                                                      PDMAT 68
      GO TO 40                                                          PDMAT 69
C                                                                       PDMAT 70
   30 CONTINUE                                                          PDMAT 71
C                                                                       PDMAT 72
C     CONSIDER 1 DIRECTION AS DIRECTION OF INTEREST                     PDMAT 73
C                                                                       PDMAT 74
      CALL BAXIAL (S1,S2,ALPH1,SP1,EP1,DIRT1,EC1)                       PDMAT 75
      SOT=SOT1                                                          PDMAT 76
      SP=SP1                                                            PDMAT 77
      SCT=S1                                                            PDMAT 78
      IF (ABS(S1).GE.ABS(SP)) EC1=0.0                                   PDMAT 79
      DIRECT=DIRT1                                                      PDMAT 80
C                                                                       PDMAT 81
   40 CONTINUE                                                          PDMAT 82
C                                                                       PDMAT 83
C     CHECK EFFECTIVE LAYER FOR FAILURE                                 PDMAT 84
C                                                                       PDMAT 85
      IF (DIRECT.EQ.5HNONE ) GO TO 130                                  PDMAT 86
C                                                                       PDMAT 87
C     CHECK EFFECTIVE DIRECTION FOR TOLERANCE                           PDMAT 88
C                                                                       PDMAT 89
      IF (ABS(SCT).GE.ABS(SP)) GO TO 50                                 PDMAT 90
      GO TO 130                                                         PDMAT 91
C                                                                       PDMAT 92
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   50 CONTINUE                                                          PDMAT 93
C                                                                       PDMAT 94
C     FIND PRESCAN FACTOR                                               PDMAT 95
C                                                                       PDMAT 96
      IF (ABS(SCT-SOT).LT.1.0E-(6) GO TO 60                             PDMAT 97
      ELOW=SP-SP*TOLF/2.0                                               PDMAT 98
      TEMP=ABS((ELOW-SOT)/(SCT-SOT))                                    PDMAT 99
      IF (TEMP.LT.PF) PF=TEMP                                           PDMAT100
      GO TO 130                                                         PDMAT101
   60 CONTINUE                                                          PDMAT102
      PF=0.0                                                            PDMAT103
      GO TO 130                                                         PDMAT104
C                                                                       PDMAT105
   70 CONTINUE                                                          PDMAT106
C                                                                       PDMAT107
C     NO CRACKS IN ELEMENT                                              PDMAT108
C                                                                       PDMAT109
C                                                                       PDMAT110
C     FIND PRINCIPAL DIRECTIONS AND TRANSFORM ALL STRESS-STATE TO       PDMAT111
C          CURRENT PRINCIPAL AXIS                                       PDMAT112
      CALL PRNCIP (SX,SY,SXY,S1,S2,THETAS)                              PDMAT113
      CALL TRANG (SXXOT,SYYOT,SXYOT,THETAS,SOT1,SOT2,SOT3)              PDMAT114
      SOT2=-SOT2                                                        PDMAT115
      SOT1=-SOT1                                                        PDMAT116
      S1=-S1                                                            PDMAT117
      S2=-S2                                                            PDMAT118
C                                                                       PDMAT119
C     CONSIDER 1 DIRECTION AS DIRECTION OF INTREST                      PDMAT120
C                                                                       PDMAT121
      CALL BAXIAL (S1,S2,ALPH1,SP1,EP1,DIRT1,EC1)                       PDMAT122
      IF (ABS(S1).GE.ABS(SP1)) EC1=0.0                                  PDMAT123
      IF (DIRT1.EQ.5HCRUSH.AND.EC1.EQ.0.0.AND.ICMPLT.EQ.3HYES) EC2=0.0  PDMAT124
C                                                                       PDMAT125
C     CONSIDER 2 DIRECTION AS DIRECTION OF INTREST                      PDMAT126
C                                                                       PDMAT127
      CALL BAXIAL (S2,S1,ALPH2,SP2,EP2,DIRT2,EC2)                       PDMAT128
      IF (ABS(S2).GT.ABS(SP2)) EC2=0.0                                  PDMAT129
      IF (DIRT2.EQ.5HCRUSH.AND.EC2.EQ.0.0.AND.ICMPLT.EQ.3HYES) EC1=0.0  PDMAT130
C                                                                       PDMAT131
C     CHECK FAILURE STRESS DIRECTION                                    PDMAT132
C                                                                       PDMAT133
      IF (DIRT1.EQ.5HNONE ) GO TO 80                                    PDMAT134
C                                                                       PDMAT135
C     S1 WILL CAUSE CRACK                                               PDMAT136
C     S2 IS EFFECTIVE                                                   PDMAT137
C                                                                       PDMAT138
      SOT=SOT1                                                          PDMAT139
      SP=SP1                                                            PDMAT140
      SCT=S1                                                            PDMAT141
      GO TO 90                                                          PDMAT142
   80 CONTINUE                                                          PDMAT143
C                                                                       PDMAT144
C     S2 WILL CAUSE CRACK                                               PDMAT145
C     S1 IS EFFECTIVE                                                   PDMAT146
C                                                                       PDMAT147
      SOT=SOT2                                                          PDMAT148
      SP=SP2                                                            PDMAT149
      SCT=S2                                                            PDMAT150
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   90 CONTINUE                                                          PDMAT151
      IF (ABS(SCT).GE.ABS(SP)) GO TO 100                                PDMAT152
      GO TO 130                                                         PDMAT153
C                                                                       PDMAT154
C     FIND PRESCAN FACTOR                                               PDMAT155
C                                                                       PDMAT156
  100 CONTINUE                                                          PDMAT157
      IF (ABS(SCT-SOT).LT.1.0E-06) GO TO 110                            PDMAT158
      ELOW=SP-SP*TOLF/2.0                                               PDMAT159
      TEMP=ABS((ELOW-SOT)/(SCT-SOT))                                    PDMAT160
      IF (TEMP.LT.PF) PF=TEMP                                           PDMAT161
      GO TO 130                                                         PDMAT162
  110 CONTINUE                                                          PDMAT163
      PF=0.0                                                            PDMAT164
      GO TO 130                                                         PDMAT165
  120 CONTINUE                                                          PDMAT166
C                                                                       PDMAT167
C     STEEL LAYERS                                                      PDMAT168
C                                                                       PDMAT169
      ANG=SPHI(ML-NULAY)                                                PDMAT170
      M=NSTYPE(ML-NULAY)                                                PDMAT171
      THETAS=ANG                                                        PDMAT172
      RN=SPRON(M)                                                       PDMAT173
      RM=SPROM(M)                                                       PDMAT174
      ES=SEMOD(M)                                                       PDMAT175
      SIGMAY=SIGMAP(M)                                                  PDMAT176
      CALL TRANG (SX,SY,SXY,ANG,S1,S2,S3)                               PDMAT177
      EC1=ES/(1.0+RN*(1.0-RM)/RM*((ABS(S1)/SIGMAY)**(RN-1.0)))          PDMAT178
  130 CONTINUE                                                          PDMAT179
C                                                                       PDMAT180
C     FIND V1 AND V2                                                    PDMAT181
C     FIND ELASTICITY RELATION                                          PDMAT182
C                                                                       PDMAT183
      VA=V                                                              PDMAT184
      VB=V                                                              PDMAT185
      IF (EC1.EQ.0..AND.EC2.EQ.0.0) GO TO 170                           PDMAT186
      IF (EC1.EQ.0..OR.EC2.EQ.0.0) GO TO 140                            PDMAT187
      V1=V                                                              PDMAT188
      V2=(EC1*(1.0-V1*ALPH1)/(EC2*V1))+ALPH2                            PDMAT189
      V2=1.0/V2                                                         PDMAT190
      IF (V1.GE.0.0.AND.V2.GE.0.0) VB=V2                                PDMAT191
      IF (V1.GE.0.0.AND.V2.GE.0.0) VA=V1                                PDMAT192
      IF (V2.LE.V1.AND.V2.GE.0.0) GO TO 150                             PDMAT193
      V2=V                                                              PDMAT194
      V1=(EC2*(1.0-V2*ALPH2)/(EC1*V2))+ALPH1                            PDMAT195
      V1=1.0/V1                                                         PDMAT196
      IF (V1.GE.0.0.AND.V2.GE.0.0) VB=V2                                PDMAT197
      IF (V1.GE.0.0.AND.V2.GE.0.0) VA=V1                                PDMAT198
      IF (V1.LE.V2.AND.V1.GE.0.0) GO TO 150                             PDMAT199
      V1=VA                                                             PDMAT200
      V2=VB                                                             PDMAT201
      GO TO 150                                                         PDMAT202
  140 CONTINUE                                                          PDMAT203
      V1=0.                                                             PDMAT204
      V2=0.                                                             PDMAT205
      EC1=EC1*(1.0-V*ALPH1)                                             PDMAT206
      EC2=EC2*(1.0-V*ALPH2)                                             PDMAT207
      GO TO 160                                                         PDMAT208
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  150 CONTINUE                                                          PDMAT209
      EC1=EC1*(1.0-V1*ALPH1)                                            PDMAT210
      EC2=EC2*(1.0-V2*ALPH2)                                            PDMAT211
  160 CONTINUE                                                          PDMAT212
C                                                                       PDMAT213
C     COMPUTE COUPLED DC MATRIX                                         PDMAT214
C                                                                       PDMAT215
      A=1.0-V1*V2                                                       PDMAT216
      DD(1,1)=EC1/A                                                     PDMAT217
      DD(1,2)=EC1*V2/A                                                  PDMAT218
      DD(2,1)=DD(1,2)                                                   PDMAT219
      DD(2,2)=EC2/A                                                     PDMAT220
      DD(3,3)=EC1*EC2/(EC1+EC2+2.0*EC2*V1)                              PDMAT221
C                                                                       PDMAT222
C     TRANSFORM TO X-Y COORDINATES                                      PDMAT223
C                                                                       PDMAT224
      CALL TRANS (DD,THETAS,DDD)                                        PDMAT225
  170 CONTINUE                                                          PDMAT226
      RETURN                                                            PDMAT227
      END                                                               PDMAT228
      SUBROUTINE STRANO (N,ML,CT,EE,NULAY,NUMEL,NSLAYR,PZC,PDT,DT,SZC)  STRANO 2
C                                                                       STRANO 3
C     THIS SUBROUTINE COMPUTES THE OUT-OF-PLANE STRAIN INCREMENTS       STRANO 4
C     IN PLATE LAYERS.                                                  STRANO 5
C                                                                       STRANO 6
      DIMENSION PDT(NULAY), PZC(NULAY), SZC(NSLAYR), EE(3), CT(3)       STRANO 7
      ABAR=(PZC(1)-PDT(1)/2.0+PZC(NULAY)+PDT(NULAY)/2.0)                STRANO 8
      ABAR=ABAR*DT/2.0                                                  STRANO 9
      IF (ML.GT.NULAY) GO TO 10                                         STRANO10
      DTSTAR=PZC(ML)*DT-ABAR                                            STRANO11
      GO TO 20                                                          STRANO12
   10 CONTINUE                                                          STRANO13
      DTSTAR=SZC(ML-NULAY)-ABAR                                         STRANO14
   20 CONTINUE                                                          STRANO15
      EE(1)=DTSTAR*CT(1)                                                STRANO16
      EE(2)=DTSTAR*CT(2)                                                STRANO17
      EE(3)=DTSTAR*CT(3)                                                STRANO18
      RETURN                                                            STRANO19
      END                                                               STRANO20
      SUBROUTINE BCHECK (KC,NIX,NBEAMX,NULAYB,KMAT,NA1,IO,CUB,EIB,DUM,NPBCHECK 2
     1IX,NPKX,SIBXXC,SIBXXA,ITYPE,FT,SIGO,ESX,EDOWNT,EDOWN,DISP,DISPLA,ZBCHECK 3
     2CRD,XLNGTH,ASXLR,EPSPS,STRAN,FCADD,IOUT)                          BCHECK 4
C                                                                       BCHECK 5
C     THIS SUBROUTINE ASSIGNS LAYER FAILURES AND COMPUTES               BCHECK 6
C         THE FICTITIOUS FORCES                                         BCHECK 7
C                                                                       BCHECK 8
      DIMENSION CUB(NBEAMX), EIB(NBEAMX), DUM(NULAYB), SIBXXA(NULAYB), SBCHECK 9
     1IBXXC(NULAYB), ITYPE(NULAYB), ZCRD(NULAYB), ASXLR(NULAYB), EPSPS(NBCHECK10
     2ULAYB), ESX(NULAYB,NBEAMX), SIGO(KMAT), FT(KMAT), EDOWN(KMAT), STRBCHECK11
     3AN(KMAT), EDOWNT(KC), FCADD(NA1), DISP(NA1), DISPLA(NA1), DUMMY(1)BCHECK12
      COMMON /PFACT/ PFC                                                BCHECK13
      COMMON /C8309/ FT(L,CTOL                                          BCHECK14
      COMMON /HIST/ NVAL(10),IVAL(10),FVAL(10)                          BCHECK15
C                                                                       BCHECK16
C                                                                       BCHECK17
      IF (PFC.NE.0.0) REWIND 5                                          BCHECK18
      REWIND 15                                                         BCHECK19
      REWIND 23                                                         BCHECK20
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      REWIND 27                                                          BCHECK21
      REWIND 25                                                          BCHECK22
C                                                                        BCHECK23
      WRITE (IO,10)                                                      BCHECK24
   10 FORMAT (/,1H0,10X,*BEAM - NEWLY CRACKED, CRUSHED OR YIELDED LAYERSBCHECK25
     1*)                                                                 BCHECK26
      WRITE (IO,20)                                                      BCHECK27
   20 FORMAT (1H0,5X,*ELEMENT  LAYER*)                                   BCHECK28
C                                                                        BCHECK29
      DO 120 J=1,NBEAMX                                                  BCHECK30
      READ (23) SIBXXC                                                   BCHECK31
      READ (15) SIBXXA                                                   BCHECK32
      READ (27) XLNGTH,GKEI,NPIX,NPKX,ITYPE,ASXLR,DUM,ZCRD,DUM           BCHECK33
      READ (25) EPSPS                                                    BCHECK34
      II=5*NPIX                                                          BCHECK35
      KK=5*NPKX                                                          BCHECK36
      DZCR = 0.                                                          BCHECK37
      DASX=0.                                                            BCHECK38
      ICALL=3HNO                                                         BCHECK39
C                                                                        BCHECK40
      DO 100 I=1,NULAYB                                                  BCHECK41
C                                                                        BCHECK42
      SIBC=SIBXXC(I)                                                     BCHECK43
      SIBA=SIBXXA(I)                                                     BCHECK44
      K=ITYPE(I)                                                         BCHECK45
      ASX=ASXLR(I)                                                       BCHECK46
      ZCR=ZCRD(I)                                                        BCHECK47
      ES=ESX(I,J)                                                        BCHECK48
      EPSXBT=EIB(J)+ZCR*CUB(J)                                           BCHECK49
      SIG=SIBA+SIBC                                                      BCHECK50
      IF (ES.EQ.0.0.AND.ABS(SIG).LE.1.E-06) GO TO 100                    BCHECK51
C                                                                        BCHECK52
C     CHECK FOR LAYER FAILURE                                            BCHECK53
C     SET UP HISTOGRAM VALUES                                            BCHECK54
C                                                                        BCHECK55
      IF (K.GT.KC) GO TO 60                                              BCHECK56
      IF (ES.EQ.0.0) GO TO 40                                            BCHECK57
C                                                                        BCHECK58
      FTM=FT(K)*(1.-FTOL)                                                BCHECK59
      SIGM=FTM                                                           BCHECK60
      IF (SIG.LT.0.) SIGM=-(SIGO(K)*(1.0-CTOL))                          BCHECK61
      IF (ABS(SIG).LT.ABS(SIGM)) GO TO 100                               BCHECK62
C                                                                        BCHECK63
      IF (FVAL(4).EQ.-999.0.AND.SIG.GE.C.) FVAL(4)=999.0                 BCHECK64
      IF (FVAL(5).EQ.-999.0.AND.SIG.LT.0.0) FVAL(5)=999.0                BCHECK65
C                                                                        BCHECK66
      IF (ES.NE.0.0) WRITE (IO,30) J,I                                   BCHECK67
   30 FORMAT (1H ,9X,I3,4X,I3)                                           BCHECK68
C                                                                        BCHECK69
      ESX(I,J)=0.                                                        BCHECK70
      ES=0.0                                                             BCHECK71
      GO TO 100                                                          BCHECK72
   40 CONTINUE                                                           BCHECK73
      IF (PFC.EQ.0.0) GO TO 100                                          BCHECK74
      IF (SIG.LT.0.) GO TO 50                                            BCHECK75
C                                                                        BCHECK76
      IF (EPSXBT.LT.0.0) GO TO 100                                       BCHECK77
      SIGF=EDOWNT(K)*EPSXBT                                              BCHECK78
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      GO TO 70                                                          BCHECK79
C                                                                       BCHECK80
C                                                                       BCHECK81
   50 CONTINUE                                                          BCHECK82
      IF (EPSXBT.GT.0.0) GO TO 100                                      BCHECK83
   60 CONTINUE                                                          BCHECK84
C                                                                       BCHECK85
C     FIND STRAINS FOR UNLOADING                                        BCHECK86
C                                                                       BCHECK87
      UI=DISPLA(II-4)+DISP(II-4)                                        BCHECK88
      UK=DISPLA(KK-4)+DISP(KK-4)                                        BCHECK89
      THETAI=DISPLA(II)+DISP(II)                                        BCHECK90
      THETAK=DISPLA(KK)+DISP(KK)                                        BCHECK91
      EPS=(UK-UI+(THETAK-THETAI)*ZCR)/XLNGTH                            BCHECK92
      EPS=EPS+EPSPS(I)                                                  BCHECK93
      IF (K.GT.KC) GO TO 90                                             BCHECK94
      IF (EPS.GE.STRAN(K)) GO TO 100                                    BCHECK95
C                                                                       BCHECK96
C     FIND STRESS TO UNLOAD                                             BCHECK97
C                                                                       BCHECK98
      EPS=EPS-STRAN(K)                                                  BCHECK99
      IF (EPS.LT.EPSXBT) SIGF=EDOWN(K)*EPSXBT                           BCHEC100
      IF (EPS.GT.EPSXBT) SIGF=EDOWN(K)*EPS                              BCHEC101
C                                                                       BCHEC102
   70 CONTINUE                                                          BCHEC103
      IF (ABS(SIGF).GE.ABS(SIG)) SIGF=SIG*(1.-1.E-10)                   BCHEC104
      IF (PFC.EQ.0.0) GO TO 80                                          BCHEC105
      SIBXXA(I)=SIBA-SIGF                                               BCHEC106
   80 CONTINUE                                                          BCHEC107
C                                                                       BCHEC108
C     COMPUTE FICTITIOUS FORCES                                         BCHEC109
C                                                                       BCHEC110
      ICALL=3HYES                                                       BCHEC111
      DASX=SIGF*ASX+DASX                                                BCHEC112
      DZCR=SIGF*ASX*ZCR+DZCR                                            BCHEC113
C                                                                       BCHEC114
      GO TO 100                                                         BCHEC115
C                                                                       BCHEC116
C     SET UP HISTOGRAM                                                  BCHEC117
C                                                                       BCHEC118
   90 CONTINUE                                                          BCHEC119
      IF (ABS(SIG).GT.SIGO(K).AND.FVAL(6).EQ.-999.0) FVAL(6)=999.0      BCHEC120
C                                                                       BCHEC121
  100 CONTINUE                                                          BCHEC122
C                                                                       BCHEC123
      IF (ICALL.NE.3HYES) GO TO 110                                     BCHEC124
      IF (PFC.EQ.0.0) GO TO 110                                         BCHEC125
C                                                                       BCHEC126
C     PLACE FICTITIOUS FORCES INTO THE FORCE VECTOR                     BCHEC127
C                                                                       BCHEC128
      FCADD(II-4)=FCADD(II-4)-DASX                                      BCHEC129
      FCADD(KK-4)=FCADD(KK-4)+DASX                                      BCHEC130
      FCADD(II)=FCADD(II)-DZCR                                          BCHEC131
      FCADD(KK)=FCADD(KK)+DZCR                                          BCHEC132
  110 CONTINUE                                                          BCHEC133
C                                                                       BCHEC134
      IF (PFC.EQ.0.0) GO TO 120                                         BCHEC135
      WRITE (5) SIBXXA                                                  BCHEC136
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  120 CONTINUE                                                          BCHEC137
      IF (PFC.EQ.0.0) RETURN                                            BCHEC138
      REWIND 5                                                          BCHEC139
      REWIND 15                                                         BCHEC140
      CALL FTNCOPY (4LJUM5,3LJ15,0)                                     BCHEC141
      RETURN                                                            BCHEC142
      END                                                               BCHEC143
      SUBROUTINE PCHECK (IO,NA1,NUMEL,NCNS,NULAY,NSLAYR,NSMAT,NANA,PZC,PPCHECK  2
     1DT,SZC,SDT,DT,ELLA,ELLB,NPI,NPJ,NPK,NPL,FCADD,CTXX,CTYY,CTXY,CUXX,PCHECK  3
     2CUYY,CUXY,ETXX,ETYY,ETXY,EIXX,EIYY,EIXY,SXXOT,SYYOT,SXYOT,SIGXXO,SPCHECK  4
     3IGYYO,SIGXYO,AS1,AF,AS,AFT,AST,NSTYPE,SPHI,SIGMAP)                PCHECK  5
C                                                                       PCHECK  6
C     THIS SUBROUTINE SETS THE ANGLE CODES FOR CRACKING AND CRUSHING    PCHECK  7
C     AND COMPUTES THE FICTIOUS FORCE VECTOR                            PCHECK  8
C                                                                       PCHECK  9
      DIMENSION FCADD(NA1), CTXX(NUMEL), CTYY(NUMEL), CTXY(NUMEL), CUXX(PCHECK10
     1NUMEL), CUYY(NUMEL), CUXY(NUMEL), SXXOT(NCNS), SYYOT(NCNS), SXYOT(PCHECK11
     2NCNS), SIGXXO(NCNS), SIGYYO(NCNS), SIGXYO(NCNS), AS1(NUMEL,NCNS), PCHECK12
     3AF(NUMEL,NULAY), AS(NUMEL,NULAY), ETXX(NUMEL), ETYY(NUMEL), ETXY(NPCHECK13
     4UMEL), EIXX(NUMEL), EIYY(NUMEL), EIXY(NUMEL), SIGMAP(NSMAT), SPHI(PCHECK14
     5NSLAYR), NSTYPE(NSLAYR), AFT(NCNS), AST(NCNS), CT(3), EE(3), CTOT(PCHECK15
     63), ETOT(3), DD(3,3), DDD(3,3)                                    PCHECK16
      COMMON /EDOWN/ EDOWNC,EDOWNT                                      PCHECK17
      COMMON /PROPC/ V,EC,FC,ECOMP,FT,ET,PCOMP,ALMM,SALMM,EALMM,ALICC   PCHECK18
      COMMON /TFAIL/ TOLF                                               PCHECK19
      COMMON /PFACT/ PFC                                                PCHECK20
      COMMON /COMPLT/ ICMPLT                                            PCHECK21
C                                                                       PCHECK22
      IF (PFC.NE.0.0) REWIND 5                                          PCHECK23
      REWIND 4                                                          PCHECK24
      REWIND 32                                                         PCHECK25
      REWIND 19                                                         PCHECK26
      REWIND 21                                                         PCHECK27
      REWIND 28                                                         PCHECK28
      REWIND 31                                                         PCHECK29
C                                                                       PCHECK30
      IF (PFC.EQ.0.0) GO TO 20                                          PCHECK31
      DO 10 I=1,NA1                                                     PCHECK32
   10 FCADD(I)=0.0                                                      PCHECK33
   20 CONTINUE                                                          PCHECK34
      WRITE (IO,30)                                                     PCHECK35
   30 FORMAT (/,1H0,10X,*SLAB - NEWLY CRACKED, CRUSHED OR YIELDED LAYERSPCHECK36
     1*)                                                                PCHECK37
      WRITE (IO,40)                                                     PCHECK38
   40 FORMAT (1H0,5X,*ELEMENT  LAYER    ANGLE*)                         PCHECK39
C                                                                       PCHECK40
      DO 190 N=1,NUMEL                                                  PCHECK41
      READ (32) AFT,AST                                                 PCHECK42
      READ (28) DT,ELLA,ELLB,NPI,NPJ,NPK,NPL                           PCHECK43
      READ (19) SIGXXO,SIGYYO,SIGXYO                                    PCHECK44
      READ (21) SXXOT,SYYOT,SXYOT                                       PCHECK45
      CTOT(1)=CTXX(N)                                                   PCHECK46
      CTOT(2)=CTYY(N)                                                   PCHECK47
      CTOT(3)=CTXY(N)                                                   PCHECK48
      CT(1)=CUXX(N)                                                     PCHECK49
      CT(2)=CUYY(N)                                                     PCHECK50
      CT(3)=CUXY(N)                                                     PCHECK51
      ICALL=3HNO                                                        PCHECK52
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      ISTART=3HYES                                                      PCHECK53
      IEND=3HNO                                                         PCHECK54
      DO 180 ML=1,NCNS                                                  PCHECK55
C                                                                       PCHECK56
C     CURRENT TOTAL STRESS LEVEL                                        PCHECK57
C                                                                       PCHECK58
      SX=SXXOT(ML)+SIGXXO(ML)                                           PCHECK59
      SY=SYYOT(ML)+SIGYYO(ML)                                           PCHECK60
      SXY=SXYOT(ML)+SIGXYO(ML)                                          PCHECK61
C                                                                       PCHECK62
C     CHECK IF A LAYER HAS CRACKED OR CRUSHED                           PCHECK63
C                                                                       PCHECK64
      IF (ML.GT.NULAY) GO TO 170                                        PCHECK65
      IF (AS1(N,ML).NE.999.0) GO TO 50                                  PCHECK66
      GO TO 130                                                         PCHECK67
   50 CONTINUE                                                          PCHECK68
C                                                                       PCHECK69
C     CRACKED- CRUSHED PROCEEDURE                                       PCHECK70
C                                                                       PCHECK71
      ANG=AS1(N,ML)                                                     PCHECK72
      ANGF=AF(N,ML)                                                     PCHECK73
      ANGDS=-ANG                                                        PCHECK74
      CALL TRANG (SX,SY,SXY,ANG,S1,S2,S3)                               PCHECK75
      S1=-S1                                                            PCHECK76
      S2=-S2                                                            PCHECK77
C                                                                       PCHECK78
C     CURRENT TOTAL STRAIN LEVEL                                        PCHECK79
C                                                                       PCHECK80
      CALL STRANO (N,ML,CTOT,ETOT,NULAY,NUMEL,NSLAYR,PZC,PDT,DT,SZC)    PCHECK81
      CALL STRANO (N,ML,CT,EE,NULAY,NUMEL,NSLAYR,PZC,PDT,DT,SZC)        PCHECK82
      EX=ETXX(N)+EIXX(N)+EE(1)+ETOT(1)                                  PCHECK83
      EY=ETYY(N)+EIYY(N)+ETOT(2)+EE(2)                                  PCHECK84
      EXY=ETXY(N)+EIXY(N)+EE(3)+ETOT(3)                                 PCHECK85
      EOTXX=ETXX(N)+ETOT(1)                                             PCHECK86
      EOTYY=ETYY(N)+ETOT(2)                                             PCHECK87
      EOTXY=ETXY(N)+ETOT(3)                                             PCHECK88
      EOTXY=0.5*EOTXY                                                   PCHECK89
      EXY=0.5*EXY                                                       PCHECK90
      SD1=0.                                                            PCHECK91
      SD2=0.                                                            PCHECK92
      SD3=0.                                                            PCHECK93
C                                                                       PCHECK94
C     TRANSFORM STRESSES AND STRAINS TO CRACKED AXIS                    PCHECK95
C                                                                       PCHECK96
      CALL TRANG (EX,EY,EXY,ANG,E1,E2,E3)                               PCHECK97
      CALL TRANG (EOTXX,EOTYY,EOTXY,ANG,EOT1,EOT2,EOT3)                 PCHECK98
C                                                                       PCHECK99
C     CHANGE SIGN DUE TO DIFFERENT CONVENTIONS USED                     PCHEC100
C                                                                       PCHEC101
      E1=-E1                                                            PCHEC102
      E2=-E2                                                            PCHEC103
      EOT1=-EOT1                                                        PCHEC104
      EOT2=-EOT2                                                        PCHEC105
C                                                                       PCHEC106
C     GET STRESS STRAIN RELATIONSHIP                                    PCHEC107
C     GET LIMITS                                                        PCHEC108
C                                                                       PCHEC109
C                                                                       PCHEC110
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C     CHECK IF SECOND CRACK HAS DEVELOPED                                PCHEC111
C                                                                        PCHEC112
      IF (AS(N,ML).NE.999.0) GO TO 100                                   PCHEC113
C                                                                        PCHEC114
C     CHECK DIRECTION OF CRACK                                           PCHEC115
C                                                                        PCHEC116
      IF (ANG.EQ.ANGF) GO TO 80                                          PCHEC117
C                                                                        PCHEC118
C     S2 IS STILL EFFECTIVE                                              PCHEC119
C     CRACK IS IN THE DIRECTION OF S2                                    PCHEC120
C     CHECK IF EFFECTIVE DIRECTION IS CRACKED                            PCHEC121
C                                                                        PCHEC122
      CALL BAXIAL (S2,S1,ALPH2,SP2,EP2,DIRT2,EC2)                        PCHEC123
      IF (DIRT2.EQ.5HNONE ) GO TO 70                                     PCHEC124
      ELOW=SP2-SP2*TOLF                                                  PCHEC125
      IF (ABS(S2).LT.ABS(ELOW)) GO TO 70                                 PCHEC126
      AST(ML)=DIRT2                                                      PCHEC127
      AS(N,ML)=ANGF+90.                                                  PCHEC128
      WRITE (IO,60) N,ML,AS(N,ML)                                        PCHEC129
   60 FORMAT (1H0,9X,I3,4X,I3,2X,F9.4)                                   PCHEC130
   70 CONTINUE                                                           PCHEC131
      IF (PFC.EQ.0.0) GO TO 180                                          PCHEC132
C                                                                        PCHEC133
C     UNLOAD IN S1 DIRECTION                                             PCHEC134
C                                                                        PCHEC135
      IF (ABS(S1).LE.1.0E-03) GO TO 120                                  PCHEC136
      IF (ABS(E1).LT.ABS(EOT1)) GO TO 120                                PCHEC137
C                                                                        PCHEC138
C     UNLOAD                                                             PCHEC139
C     SET DOWNWARD MODULUS FOR DETERMINING FICTITIOUS FORCES             PCHEC140
C                                                                        PCHEC141
      ISE=0                                                              PCHEC142
      IS=0                                                               PCHEC143
      DD(1,1)=+EDOWNC                                                    PCHEC144
      IF (S1.LT.0.0) DD(1,1)=-EDOWNT                                     PCHEC145
      DE=E1-EOT1                                                         PCHEC146
      IF (DE.GT.0.0) DD(1,1)=-DD(1,1)                                    PCHEC147
      DS=(E1-EOT1)*DD(1,1)                                               PCHEC148
      IF (S1.GE.0.0) IS=1                                                PCHEC149
      IF ((DS+S1).GE.0.0) ISE=1                                          PCHEC150
      IF (IS.NE.ISE) DS=-S1                                              PCHEC151
      SD1=DS                                                             PCHEC152
      GO TO 120                                                          PCHEC153
C                                                                        PCHEC154
   80 CONTINUE                                                           PCHEC155
C                                                                        PCHEC156
C     S1 IS STILL EFFECTIVE                                              PCHEC157
C     CRACK IS IN THE DIRECTION OF S1                                    PCHEC158
C     CHECK IF EFFECTIVE DIRECTION IS CRACKED                            PCHEC159
C                                                                        PCHEC160
      CALL BAXIAL (S1,S2,ALPH1,SP1,EP1,DIRT1,EC1)                        PCHEC161
      IF (DIRT1.EQ.5HNONE ) GO TO 90                                     PCHEC162
      ELOW=SP1-TOLF*SP1                                                  PCHEC163
      IF (ABS(S1).LT.ABS(ELOW)) GO TO 90                                 PCHEC164
      AST(ML)=DIRT1                                                      PCHEC165
      AS(N,ML)=ANGF+90.                                                  PCHEC166
      WRITE (IO,60) N,ML,AS(N,ML)                                        PCHEC167
   90 CONTINUE                                                           PCHEC168
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      IF (PFC.EQ.0.0) GO TO 180                                          PCHEC169
C                                                                        PCHEC170
C     UNLOAD IN S2 DIRECTION                                             PCHEC171
C                                                                        PCHEC172
      IF (ABS(S2).LE.1.0E-03) GO TO 120                                  PCHEC173
      IF (ABS(E2).LT.ABS(EOT2)) GO TO 120                                PCHEC174
C                                                                        PCHEC175
C     UNLOAD                                                             PCHEC176
C     SET DOWNWARD MODULUS FOR DETERMINING FICTITIOUS FORCES             PCHEC177
C                                                                        PCHEC178
      ISE=0                                                              PCHEC179
      IS=0                                                               PCHEC180
      DD(2,2)=+EDOWNC                                                    PCHEC181
      IF (S2.LT.0.0) DD(2,2)=-EDOWNT                                     PCHEC182
      DE=E2-EOT2                                                         PCHEC183
      IF (DE.GT.0.0) DD(2,2)=-DD(2,2)                                    PCHEC184
      DS=(E2-EOT2)*DD(2,2)                                               PCHEC185
      IF (S2.GE.0.0) IS=1                                                PCHEC186
      IF ((DS+S2).GE.0.0) ISE=1                                          PCHEC187
      IF (IS.NE.ISE) DS=-S2                                              PCHEC188
      SD2=DS                                                             PCHEC189
      GO TO 120                                                          PCHEC190
C                                                                        PCHEC191
  100 CONTINUE                                                           PCHEC192
      IF (PFC.EQ.0.0) GO TO 180                                          PCHEC193
C                                                                        PCHEC194
C     BOTH PRINCIPAL DIRECTIONS ARE CRACKED                              PCHEC195
C                                                                        PCHEC196
      IF (ABS(S1).LE.1.0E-03) GO TO 110                                  PCHEC197
      IF (ABS(E1).LT.ABS(EOT1)) GO TO 110                                PCHEC198
      ISE=0                                                              PCHEC199
      IS=0                                                               PCHEC200
      DD(1,1)=+EDOWNC                                                    PCHEC201
      IF (S1.LT.0.0) DD(1,1)=-EDOWNT                                     PCHEC202
      DE=E1-EOT1                                                         PCHEC203
      IF (DE.GT.0.0) DD(1,1)=-DD(1,1)                                    PCHEC204
      DS=(E1-EOT1)*DD(1,1)                                               PCHEC205
      IF (S1.GE.0.0) IS=1                                                PCHEC206
      IF ((DS+S1).GE.0.0) ISE=1                                          PCHEC207
      IF (IS.NE.ISE) DS=-S1                                              PCHEC208
      SD1=DS                                                             PCHEC209
  110 CONTINUE                                                           PCHEC210
      IF (ABS(S2).LE.1.0E-03) GO TO 120                                  PCHEC211
      IF (ABS(E2).LT.ABS(EOT2)) GO TO 120                                PCHEC212
      ISE=0                                                              PCHEC213
      IS=0                                                               PCHEC214
      DD(2,2)=+EDOWNC                                                    PCHEC215
      IF (S2.LT.0.0) DD(2,2)=-EDOWNT                                     PCHEC216
      DE=E2-EOT2                                                         PCHEC217
      IF (DE.GT.0.0) DD(2,2)=-DD(2,2)                                    PCHEC218
      DS=(E2-EOT2)*DD(2,2)                                               PCHEC219
      IF (S2.GE.0.0) IS=1                                                PCHEC220
      IF ((DS+S2).GE.0.0) ISE=1                                          PCHEC221
      IF (IS.NE.ISE) DS=-S2                                              PCHEC222
      SD2=DS                                                             PCHEC223
  120 CONTINUE                                                           PCHEC224
      IF (SD1.EQ.0.0.AND.SD2.EQ.0.0) GO TO 180                           PCHEC225
C                                                                        PCHEC226
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C     TRANSFORM FROM PRINCIPAL TO X-Y DIRECTION                          PCHEC227
C                                                                        PCHEC228
      CALL TRANG (SD1,SD2,SD3,ANGDS,SDX,SDY,SDXY)                        PCHEC229
C                                                                        PCHEC230
C     ADD RESIDUAL STRESS VECTOR TO OLD TOTAL STRESSES                   PCHEC231
C                                                                        PCHEC232
      SXXOT(ML)=SXXOT(ML)-SDX                                            PCHEC233
      SYYOT(ML)=SYYOT(ML)-SDY                                            PCHEC234
      SXYOT(ML)=SXYOT(ML)-SDXY                                           PCHEC235
C                                                                        PCHEC236
C                                                                        PCHEC237
C     DETERMINE FICTIOUS FORCE VECTOR                                    PCHEC238
C                                                                        PCHEC239
      ICALL=3HYES                                                        PCHEC240
      CALL FLOADP (N,ML,SDX,SDY,SDXY,NUMEL,NULAY,NA1,NSLAYR,NANA,ISTART,PCHEC241
     1IEND,NPI,NPJ,NPK,NPL,FZC,PDT,DT,SZC,SDT,ELLA,ELLB,FCADD)           PCHEC242
      ISTART=3HNO                                                        PCHEC243
      GO TO 180                                                          PCHEC244
  130 CONTINUE                                                           PCHEC245
C                                                                        PCHEC246
C     NO CRACKING OR CRUSHING                                            PCHEC247
C                                                                        PCHEC248
      CALL PRNCIP (SX,SY,SXY,S1,S2,THETAS)                               PCHEC249
      S1=-S1                                                             PCHEC250
      S2=-S2                                                             PCHEC251
C                                                                        PCHEC252
C     CONSIDER 1 DIRECTION AS DIRECTION OF INTREST                       PCHEC253
C                                                                        PCHEC254
      CALL BAXIAL (S1,S2,ALPH1,SP1,EP1,DIRT1,EC1)                        PCHEC255
C                                                                        PCHEC256
C     CONSIDER 2 DIRECTION AS DIRECTION OF INTREST                       PCHEC257
C                                                                        PCHEC258
      CALL BAXIAL (S2,S1,ALPH2,SP2,EP2,DIRT2,EC2)                        PCHEC259
C                                                                        PCHEC260
C     CHECK DIRECTION OF POSSIBLE CRACK                                  PCHEC261
C                                                                        PCHEC262
      IF (DIRT1.EQ.5HNONE ) GO TO 150                                    PCHEC263
C                                                                        PCHEC264
C     CRACK IS IN DIRECTION OF S2 AND CAUSED BY S1                       PCHEC265
C     S2 IS STILL EFFECTIVE                                              PCHEC266
C                                                                        PCHEC267
      ELOW=SP1-TOLF*SP1                                                  PCHEC268
      IF (ABS(S1).GE.ABS(ELOW)) GO TO 140                                PCHEC269
      GO TO 180                                                          PCHEC270
  140 CONTINUE                                                           PCHEC271
      AFT(ML)=DIRT1                                                      PCHEC272
      AS1(N,ML)=THETAS                                                   PCHEC273
      AF(N,ML)=THETAS-90.0                                               PCHEC274
      IF (ICMPLT.EQ.3HYES.AND.DIRT1.EQ.5HCRUSH) AS(N,ML)=THETAS          PCHEC275
      IF (AS(N,ML).EQ.THETAS) AST(ML)=DIRT1                              PCHEC276
      WRITE (IO,60) N,ML,AF(N,ML)                                        PCHEC277
      GO TO 180                                                          PCHEC278
C                                                                        PCHEC279
  150 CONTINUE                                                           PCHEC280
      IF (DIRT2.EQ.5HNONE ) GO TO 180                                    PCHEC281
C                                                                        PCHEC282
C     CRACK IS IN DIRECTION OF S1 AND CAUSED BY S2                       PCHEC283
C     S1 IS STILL EFFECTIVE                                              PCHEC284
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C                                                                       PCHEC285
      ELOW=SP2-TOLF*SP2                                                 PCHEC286
      IF (ABS(S2).GE.ABS(ELOW)) GO TO 160                               PCHEC287
      GO TO 180                                                         PCHEC288
  160 CONTINUE                                                          PCHEC289
      AS1(N,ML)=THETAS                                                  PCHEC290
      AF(N,ML)=THETAS                                                   PCHEC291
      AFT(ML)=DIRT2                                                     PCHEC292
      IF (ICMPLT.EQ.3HYES.AND.DIRT2.EQ.5HCRUSH) AS(N,ML)=THETAS+90.     PCHEC293
      IF (AS(N,ML).EQ.(THETAS+90.)) AST(ML)=DIRT2                       PCHEC294
      WRITE (IO,60) N,ML,AF(N,ML)                                       PCHEC295
      GO TO 180                                                         PCHEC296
C                                                                       PCHEC297
C     FOR STEEL                                                         PCHEC298
C                                                                       PCHEC299
  170 CONTINUE                                                          PCHEC300
      IF (AS1(N,ML).NE.999.0) GO TO 180                                 PCHEC301
      ANG=SPHI(ML-NULAY)                                                PCHEC302
      M=NSTYPE(ML-NULAY)                                                PCHEC303
      CALL TRANG (SX,SY,SXY,ANG,S1,S2,S3)                               PCHEC304
      IF (ABS(S1).LT.SIGMAP(M)) GO TO 180                               PCHEC305
      AFT(ML)=5HYIELD                                                   PCHEC306
      AS1(N,ML)=ANG                                                     PCHEC307
      WRITE (IO,60) N,ML,AS1(N,ML)                                      PCHEC308
C                                                                       PCHEC309
C     SET UP FICTITIOUS FORCE VECTOR                                    PCHEC310
C                                                                       PCHEC311
  180 CONTINUE                                                          PCHEC312
      IEND=3HYES                                                        PCHEC313
      WRITE (4) AFT,AST                                                 PCHEC314
      IF (PFC.EQ.0.0) GO TO 190                                         PCHEC315
      IF (ICALL.EQ.3HYES) CALL FLOADP (N,ML,SDX,SDY,SDXY,NUMEL,NULAY,NA1PCHEC316
     1,NSLAYR,NANA,ISTART,IEND,NPI,NPJ,NPK,NPL,PZC,PDT,DT,SZC,SDT,ELLA,EPCHEC317
     2LLB,FCADD)                                                        PCHEC318
      WRITE (5) SXXOT,SYYOT,SXYOT                                       PCHEC319
C                                                                       PCHEC320
C     END ROUTINE                                                       PCHEC321
C                                                                       PCHEC322
  190 CONTINUE                                                          PCHEC323
C                                                                       PCHEC324
      DO 200 I=1,NUMEL                                                  PCHEC325
      READ (32) N,ML,M                                                  PCHEC326
  200 WRITE (4) N,ML,M                                                  PCHEC327
      REWIND 31                                                         PCHEC328
      WRITE (31) AS1,AF,AS                                              PCHEC329
      REWIND 4                                                          PCHEC330
      REWIND 32                                                         PCHEC331
      CALL FTNCOPY (4LJUM4,3LJ32,0)                                     PCHEC332
      IF (PFC.EQ.0.0) RETURN                                            PCHEC333
      REWIND 5                                                          PCHEC334
      REWIND 21                                                         PCHEC335
      CALL FTNCOPY (4LJUM5,3LJ21,0)                                     PCHEC336
      RETURN                                                            PCHEC337
      END                                                               PCHEC338
      SUBROUTINE FLOADP (N,ML,SDX,SDY,SDXY,NUMEL,NULAY,NA1,NSLAYR,NANA,IFLOADP 2
     1START,IEND,NPI,NPJ,NPK,NPL,PZC,PDT,DT,SZC,SDT,ELLA,ELLB,FCADD)    FLOADP 3
C                                                                       FLOADP 4
C     THIS SUBROUTINE COMPUTES FICTITIOUS FORCES                        FLOADP 5
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C                                                                       FLOADP 6
C                                                                       FLOADP 7
      COMMON /SKEW/ PHI,AU(2,2),AO(3,3),DS(3,3)                         FLOADP 8
C                                                                       FLOADP 9
      DIMENSION SB(3), SBT(3), SUT(3), SU(3)                            FLOADP10
      DIMENSION FUT(8), FBT(12)                                         FLOADP11
      DIMENSION PDT(NULAY), PZC(NULAY), SDT(NSLAYR), SZC(NSLAYR), FCADD(FLOADP12
     1NA1), FU(8), FB(12)                                               FLOADP13
C                                                                       FLOADP14
C     CHECK FOR IEND                                                    FLOADP15
C                                                                       FLOADP16
      IF (IEND.EQ.3HYES) GO TO 40                                       FLOADP17
      IF (ISTART.EQ.3HNO ) GO TO 10                                     FLOADP18
C                                                                       FLOADP19
C     INITIALIZE                                                        FLOADP20
C                                                                       FLOADP21
      ABAR=(PZC(1)-PDT(1)/2.0+PZC(NULAY)+PDT(NULAY)/2.0)                FLOADP22
      ABAR=ABAR*DT/2.0                                                  FLOADP23
      SDXB = 0.                                                         FLOADP24
      SDYB = 0.                                                         FLOADP25
      SDXYB=0.                                                          FLOADP26
      SDXU=0.                                                           FLOADP27
      SDYU=0.                                                           FLOADP28
      SDXYU=0.                                                          FLOADP29
   10 CONTINUE                                                          FLOADP30
C                                                                       FLOADP31
C     COMPUTE INPLANE FORCE VECTOR                                      FLOADP32
C                                                                       FLOADP33
      IF (ML.GT.NULAY) GO TO 20                                         FLOADP34
      C1=(PZC(ML)-PDT(ML)/2.0)*DT                                       FLOADP35
      C2=(PZC(ML)+PDT(ML)/2.0)*DT                                       FLOADP36
      GO TO 30                                                          FLOADP37
   20 CONTINUE                                                          FLOADP38
      C2=SZC(ML-NULAY)+SDT(ML-NULAY)/2.0                                FLOADP39
      C1=SZC(ML-NULAY)-SDT(ML-NULAY)/2.0                                FLOADP40
   30 CONTINUE                                                          FLOADP41
      CONST=C2-C1                                                       FLOADP42
      SDXU=SDX*CONST+SDXU                                               FLOADP43
      SDYU=SDY*CONST+SDYU                                               FLOADP44
      SDXYU=SDXY*CONST+SDXYU                                            FLOADP45
C                                                                       FLOADP46
C     OUT OF PLANE FORCE VECTOR                                         FLOADP47
C                                                                       FLOADP48
      CONST=(C2+C1-2.0*ABAR)*(C2-C1)/2.0                                FLOADP49
      SDXB=SDXB+SDX*CONST                                               FLOADP50
      SDYB=SDYB+SDY*CONST                                               FLOADP51
      SDXYB=SDXYB+SDXY*CONST                                            FLOADP52
      RETURN                                                            FLOADP53
C                                                                       FLOADP54
C     END ROUTINE                                                       FLOADP55
C                                                                       FLOADP56
   40 CONTINUE                                                          FLOADP57
      IF (ABS(PHI).EQ.90.) GO TO 70                                     FLOADP58
      SB(1)=SDXB                                                        FLOADP59
      SB(2)=SDYB                                                        FLOADP60
      SB(3)=SDXYB                                                       FLOADP61
      SU(1)=SDXU                                                        FLOADP62
      SU(2)=SDYU                                                        FLOADP63
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      SU(3)=SDXYU                                                       FLOADP64
C                                                                       FLOADP65
C     TRANSFORM TO SKEW                                                 FLOADP66
      DO 60 I=1,3                                                       FLOADP67
      SUMB=0.                                                           FLOADP68
      SUMU=0.                                                           FLOADP69
      DO 50 L=1,3                                                       FLOADP70
      SUMB=SUMB+DS(L,I)*SB(L)                                           FLOADP71
   50 SUMU=SUMU+DS(L,I)*SU(L)                                           FLOADP72
C                                                                       FLOADP73
      SBT(I)=SUMB                                                       FLOADP74
   60 SUT(I)=SUMU                                                       FLOADP75
C                                                                       FLOADP76
      SDXB=SBT(1)                                                       FLOADP77
      SDYB=SBT(2)                                                       FLOADP78
      SDXYB=SBT(3)                                                      FLOADP79
      SDXU=SUT(1)                                                       FLOADP80
      SDYU=SUT(2)                                                       FLOADP81
      SDXYU=SUT(3)                                                      FLOADP82
   70 CONTINUE                                                          FLOADP83
C                                                                       FLOADP84
      TA=ELLB                                                           FLOADP85
      TB=ELLA                                                           FLOADP86
      TAB=2.0                                                           FLOADP87
C                                                                       FLOADP88
C     OUT OF PLANE                                                      FLOADP89
C                                                                       FLOADP90
      FB(1)=2.0*SDXYB                                                   FLOADP91
      FB(2)=-TB*SDYB                                                    FLOADP92
      FB(3)=-TA*SDXB                                                    FLOADP93
      FB(4)=-2.0*SDXYB                                                  FLOADP94
      FB(5)=+TB*SDYB                                                    FLOADP95
      FB(6)=-TA*SDXB                                                    FLOADP96
      FB(7)=-2.0*SDXYB                                                  FLOADP97
      FB(8)=-TB*SDYB                                                    FLOADP98
      FB(9)=+TA*SDXB                                                    FLOADP99
      FB(10)=+2.0*SDXYB                                                 FLOAD100
      FB(11)=+TB*SDYB                                                   FLOAD101
      FB(12)=+TA*SDXB                                                   FLOAD102
C                                                                       FLOAD103
C     INPLANE                                                           FLOAD104
C                                                                       FLOAD105
      FU(1)=-TA*SDXU+TB*SDXYU                                           FLOAD106
      FU(3)=-TA*SDXU-TB*SDXYU                                           FLOAD107
      FU(5)=+TA*SDXU+TB*SDXYU                                           FLOAD108
      FU(7)=+TA*SDXU-TB*SDXYU                                           FLOAD109
      FU(2)=-TA*SDXYU+TB*SDYU                                           FLOAD110
      FU(4)=-TA*SDXYU-TB*SDYU                                           FLOAD111
      FU(6)=+TA*SDXYU+TB*SDYU                                           FLOAD112
      FU(8)=+TA*SDXYU-TB*SDYU                                           FLOAD113
      IF (ABS(PHI).EQ.90.) GO TO 140                                    FLOAD114
C                                                                       FLOAD115
C     TRANSFORM BACK TO CARTESIAN                                       FLOAD116
C                                                                       FLOAD117
      DO 90 II=1,8,2                                                    FLOAD118
      DO 90 I=1,2                                                       FLOAD119
      SUM=0.                                                            FLOAD120
      DO 80 L=1,2                                                       FLOAD121
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   80 SUM=SUM+AU(I,L)*FU(II+L-1)                                        FLOAD122
   90 FUT(II+I-1)=SUM                                                   FLOAD123
C                                                                       FLOAD124
      DO 110 II=1,12,3                                                  FLOAD125
      DO 110 I=1,3                                                      FLOAD126
      SUM=0.                                                            FLOAD127
      DO 100 L=1,3                                                      FLOAD128
  100 SUM=SUM+AO(I,L)*FB(II+L-1)                                        FLOAD129
  110 FBT(II+I-1)=SUM                                                   FLOAD130
C                                                                       FLOAD131
      SINA=PHI*ATAN(1.0)/45.                                            FLOAD132
      SINA=SIN(SINA)                                                    FLOAD133
      DO 120 I=1,8                                                      FLOAD134
  120 FU(I)=FUT(I)*SINA                                                 FLOAD135
      DO 130 I=1,12                                                     FLOAD136
  130 FB(I)=FBT(I)*SINA                                                 FLOAD137
C                                                                       FLOAD138
  140 CONTINUE                                                          FLOAD139
C                                                                       FLOAD140
C                                                                       FLOAD141
C     PLACE ELEMENT FORCE VECTORS INTO GLOBAL FORCE VECTOR              FLOAD142
C                                                                       FLOAD143
      I=NPI*5-3                                                         FLOAD144
      J=NPJ*5-3                                                         FLOAD145
      K=NPK*5-3                                                         FLOAD146
      L=NPL*5-3                                                         FLOAD147
      DO 150 II=1,3                                                     FLOAD148
      FCADD(I+II)=FCADD(I+II)+FB(II)                                    FLOAD149
      FCADD(J+II)=FCADD(J+II)+FB(II+3)                                  FLOAD150
      FCADD(K+II)=FCADD(K+II)+FB(II+6)                                  FLOAD151
  150 FCADD(L+II)=FCADD(L+II)+FB(II+9)                                  FLOAD152
C                                                                       FLOAD153
      I=I-2                                                             FLOAD154
      J=J-2                                                             FLOAD155
      K=K-2                                                             FLOAD156
      L=L-2                                                             FLOAD157
      DO 160 II=1,2                                                     FLOAD158
      FCADD(I+II)=FCADD(I+II)+FU(II)                                    FLOAD159
      FCADD(J+II)=FCADD(J+II)+FU(II+2)                                  FLOAD160
      FCADD(K+II)=FCADD(K+II)+FU(II+4)                                  FLOAD161
      FCADD(L+II)=FCADD(L+II)+FU(II+6)                                  FLOAD162
      IF (ABS(ABAR).LT.0.001) GO TO 160                                 FLOAD163
      FCADD(I+6-II)=FCADD(I+6-II)+FU(II)*ABAR*(-1.0)**(II+1)            FLOAD164
      FCADD(J+6-II)=FCADD(J+6-II)+FU(II+2)*ABAR*(-1.0)**(II+1)          FLOAD165
      FCADD(K+6-II)=FCADD(K+6-II)+FU(II+4)*ABAR*(-1.0)**(II+1)          FLOAD166
      FCADD(L+6-II)=FCADD(L+6-II)+FU(II+6)*ABAR*(-1.0)**(II+1)          FLOAD167
  160 CONTINUE                                                          FLOAD168
      RETURN                                                            FLOAD169
      END                                                               FLOAD170
      SUBROUTINE ACCUMU (NUMEL,NA1,NBEAMX,NULAYB,NCNS,NULAY,CTXX,CTYY,CTACCUMU 2
     1XY,CUXX,CUYY,CUXY,ETXX,ETYY,ETXY,EIXX,EIYY,EIXY,SXXOT,SYYOT,SXYOT,ACCUMU 3
     2SIGXXO,SIGYYO,SIGXYO,DISPLA,DISP,FORCE,FORCEA,ESX,ITYPE,ZERO,DUM,EACCUMU 4
     3PSPS,AS1,AFT,AST,SIBXXC,SIBXXA,AF,AS)                             ACCUMU 5
C                                                                       ACCUMU 6
C     THIS SUBROUTINE FINDS ACCUMULATED VALUES OF NEEDED FIELD          ACCUMU 7
C     QUANTITIES.                                                       ACCUMU 8
C     ALSO TERMINATION CHECKS ARE MADE.                                 ACCUMU 9
C                                                                       ACCUMU10
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      DIMENSION CTXX(NUMEL), CTYY(NUMEL), CTXY(NUMEL), CUXX(NUMEL), CUYYACCUMU11
     1(NUMEL), CUXY(NUMEL), ETXX(NUMEL), ETYY(NUMEL), ETXY(NUMEL), EIXX(ACCUMU12
     2NUMEL), EIYY(NUMEL), EIXY(NUMEL), SXXOT(NCNS), SYYOT(NCNS), SXYOT(ACCUMU13
     3NCNS), SIGXXO(NCNS), SIGYYO(NCNS), SIGXYO(NCNS), SIBXXA(NULAYB), SACCUMU14
     4IBXXC(NULAYB), ESX(NULAYB,NBEAMX), ITYPE(NULAYB), ZCRB(NULAYB), DUACCUMU15
     5M(NULAYB), EPSPS(NULAYB), AS1(NUMEL,NCNS), AFT(NCNS), AST(NCNS), DACCUMU16
     6ISPLA(NA1), DISP(NA1), FORCEA(NA1), FORCE(NA1), DUMMY(1)          ACCUMU17
      DIMENSION NLH(6), NLK(6), CTOT(3), ETOT(3)                       ACCUMU18
      DIMENSION AS(NUMEL,NULAY), AF(NUMEL,NULAY), EM(2,2), ANC(2)      ACCUMU19
C                                                                      ACCUMU20
      COMMON /CB3J0/ NPERBM,NREADB,KSIG,KIN,KC,KMAT,KPS,NOBM,NNN       ACCUMU21
      COMMON /BDIM/ RON(6),ROM(6),EDOWN(6),STRAN(6),SIGC(6),FT(6),RONT(3ACCUMU22
     1),ROMT(3),EDOWNT(3),EDOWNR(3)                                    ACCUMU23
      COMMON /BTCHK/ STRAMX(6),STTEMX(6),STCEMX(6),NK(6),NH(6)         ACCUMU24
      COMMON /HISTB/ NVALB(6,5),IVALB(6,2,5)                           ACCUMU25
      COMMON /STCHK/ STRAMS(6),STTEMS(6),STCEMS(6),NKS(6),NHS(6)       ACCUMU26
      COMMON /HISTS/ NVALS(6,5),IVALS(6,2,5)                           ACCUMU27
      COMMON /PDIM/ PDT(15),PZC(15),SEMOD(4),SIGMAP(4),SPRON(4),SPROM(4)ACCUMU28
     1,NSTYPE(6),SDT(6),SZC(6),SPHI(6)                                 ACCUMU29
      COMMON /CB31C/ NELX,NSMAT,NELY                                   ACCUMU30
      COMMON /CRWS/ ACR(2),CMIN(2),WCMAX(2),W,NW,DC,SURC               ACCUMU31
C                                                                      ACCUMU32
      REWIND 5                                                         ACCUMU33
      REWIND 19                                                        ACCUMU34
      REWIND 21                                                        ACCUMU35
      REWIND 15                                                        ACCUMU36
      REWIND 23                                                        ACCUMU37
      REWIND 25                                                        ACCUMU38
      REWIND 27                                                        ACCUMU39
      REWIND 28                                                        ACCUMU40
      REWIND 32                                                        ACCUMU41
C                                                                      ACCUMU42
C     INITIALIZE CRACK WIDTH DATA                                      ACCUMU43
C                                                                      ACCUMU44
      W=0.                                                             ACCUMU45
      NW=0                                                             ACCUMU46
      DC=0.                                                            ACCUMU47
C                                                                      ACCUMU48
      WM=0.                                                            ACCUMU49
      NWM=0                                                            ACCUMU50
      DCM=0.                                                           ACCUMU51
      SURCM=4HNONE                                                     ACCUMU52
C                                                                      ACCUMU53
      SURC=4HNONE                                                      ACCUMU54
C                                                                      ACCUMU55
      DO 220 N=1,NUMEL                                                 ACCUMU56
      READ (19) SIGXXO,SIGYYO,SIGXYO                                   ACCUMU57
      READ (21) SXXOT,SYYOT,SXYOT                                      ACCUMU58
      CTXX(N)=CTXX(N)+CUXX(N)                                          ACCUMU59
      CTYY(N)=CTYY(N)+CUYY(N)                                          ACCUMU60
      CTXY(N)=CTXY(N)+CUXY(N)                                          ACCUMU61
      ETXX(N)=ETXX(N)+EIXX(N)                                          ACCUMU62
      ETYY(N)=ETYY(N)+EIYY(N)                                          ACCUMU63
      ETXY(N)=ETXY(N)+EIXY(N)                                          ACCUMU64
C                                                                      ACCUMU65
C     READ INFORMATION FOR TERMINATION CHECKS                          ACCUMU66
C                                                                      ACCUMU67
      READ (28) DT,A,A,A,A,A,A                                         ACCUMU68
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      READ (32) AFT,AST                                                 ACCUMU69
      CTOT(1)=CTXX(N)                                                   ACCUMU70
      CTOT(2)=CTYY(N)                                                   ACCUMU71
      CTOT(3)=CTXY(N)                                                   ACCUMU72
C                                                                       ACCUMU73
      DO 10 I=1,6                                                       ACCUMU74
      NLH(I)=0                                                          ACCUMU75
   10 NLK(I)=0                                                          ACCUMU76
C                                                                       ACCUMU77
      DO 100 ML=1,NCNS                                                  ACCUMU78
      SXXOT(ML)=SXXOT(ML)+SIGXXO(ML)                                    ACCUMU79
      SYYOT(ML)=SYYOT(ML)+SIGYYO(ML)                                    ACCUMU80
      SXYOT(ML)=SXYOT(ML)+SIGXYO(ML)                                    ACCUMU81
C                                                                       ACCUMU82
C     FIND TOTAL STRAIN                                                 ACCUMU83
C                                                                       ACCUMU84
      CALL STRANO (N,ML,CTOT,ETOT,NULAY,NUMEL,NSLAYR,PZC,PDT,DT,SZC)    ACCUMU85
      EX=ETOT(1)+ETXX(N)                                                ACCUMU86
      EY=ETOT(2)+ETYY(N)                                                ACCUMU87
      EXY=ETOT(3)+ETXY(N)                                               ACCUMU88
      EXY=0.5*EXY                                                       ACCUMU89
C                                                                       ACCUMU90
C     FIND STRESSES                                                     ACCUMU91
C                                                                       ACCUMU92
      SX=SXXOT(ML)                                                      ACCUMU93
      SY=SYYOT(ML)                                                      ACCUMU94
      SXY=SXYOT(ML)                                                     ACCUMU95
C                                                                       ACCUMU96
C     CHECK FOR STEEL LAYER                                             ACCUMU97
C                                                                       ACCUMU98
      IF (ML.GT.NULAY) GO TO 50                                         ACCUMU99
C                                                                       ACCUM100
C     FOR CONCRETE                                                      ACCUM101
C                                                                       ACCUM102
      K=1                                                               ACCUM103
C                                                                       ACCUM104
C     CHECK FOR CRACKED OR CRUSHED LAYER                                ACCUM105
C                                                                       ACCUM106
      IF (AS1(N,ML).NE.999.0) GO TO 20                                  ACCUM107
C                                                                       ACCUM108
C     FOR NO CRACKING OR CRUSHING                                       ACCUM109
C                                                                       ACCUM110
      CALL PRNCIP (SX,SY,SXY,S1,S2,ANG)                                 ACCUM111
      CALL PRNCIP (EX,EY,EXY,E1,E2,ANG)                                 ACCUM112
      GO TO 30                                                          ACCUM113
   20 CONTINUE                                                          ACCUM114
C                                                                       ACCUM115
C     FOR CRACKING OR CRUSHING                                          ACCUM116
C                                                                       ACCUM117
      ANG=AS1(N,ML)                                                     ACCUM118
      CALL TRANG (SX,SY,SXY,ANG,S1,S2,S3)                               ACCUM119
      CALL TRANG (EX,EY,EXY,ANG,E1,E2,E3)                               ACCUM120
   30 CONTINUE                                                          ACCUM121
C                                                                       ACCUM122
C     FIND FAILURE STRESS                                               ACCUM123
C                                                                       ACCUM124
      S1=-S1                                                            ACCUM125
      S2=-S2                                                            ACCUM126
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      CALL BAXIAL (S1,S2,ALPH1,SP1,EP1,DIRT1,EC1)                    ACCUM127
      CALL BAXIAL (S2,S1,ALPH2,SP2,EP2,DIRT2,EC2)                    ACCUM128
C                                                                    ACCUM129
C     SET UP TOP AND BOTTOM CONCRETE LAYER STRAINS                   ACCUM130
C                                                                    ACCUM131
      IF (ML.EQ.1) EM(1,2)=E1                                        ACCUM132
      IF (ML.EQ.1) EM(2,2)=E2                                        ACCUM133
      IF (ML.EQ.NULAY) EM(1,1)=E1                                    ACCUM134
      IF (ML.EQ.NULAY) EM(2,1)=E2                                    ACCUM135
C                                                                    ACCUM136
C                                                                    ACCUM137
C     FIND CRITICAL VALUES                                           ACCUM138
C                                                                    ACCUM139
      S=0.                                                           ACCUM140
      E=0.                                                           ACCUM141
      SP=1.0E+10                                                     ACCUM142
      EP=1.0E+10                                                     ACCUM143
      DIRT=5HNONE                                                    ACCUM144
      IF (DIRT1.EQ.5HNONE ) GO TO 40                                 ACCUM145
      DIRT=DIRT1                                                     ACCUM146
      S=-S1                                                          ACCUM147
      E=E1                                                           ACCUM148
      SP=-SP1                                                        ACCUM149
      EP=-EP1                                                        ACCUM150
      GO TO 60                                                       ACCUM151
   40 IF (DIRT2.EQ.5HNONE ) GO TO 60                                 ACCUM152
      DIRT=DIRT2                                                     ACCUM153
      S=-S2                                                          ACCUM154
      E=E2                                                           ACCUM155
      SP=-SP2                                                        ACCUM156
      EP=-EP2                                                        ACCUM157
      GO TO 60                                                       ACCUM158
   50 CONTINUE                                                       ACCUM159
C                                                                    ACCUM160
C     FOR STEEL                                                      ACCUM161
C                                                                    ACCUM162
      M=NSTYPE(ML-NULAY)                                             ACCUM163
      K=M+1                                                          ACCUM164
      ANG=SPHI(ML-NULAY)                                             ACCUM165
      CALL TRANG (SX,SY,SXY,ANG,S1,S2,S3)                            ACCUM166
      CALL TRANG (EX,EY,EXY,ANG,E1,E2,E3)                            ACCUM167
      DIRT=5HCRUSH                                                   ACCUM168
      IF (S1.GE.0.0) DIRT=5HCRACK                                    ACCUM169
      S=S1                                                           ACCUM170
      E=E1                                                           ACCUM171
      SP=1.0                                                         ACCUM172
      EP=1.0                                                         ACCUM173
   60 CONTINUE                                                       ACCUM174
C                                                                    ACCUM175
C     TERMINATION CHECKS                                             ACCUM176
C                                                                    ACCUM177
C                                                                    ACCUM178
C     CHECK STRAIN                                                   ACCUM179
C                                                                    ACCUM180
      A=STRAMS(K)                                                    ACCUM181
      IF (ABS(E).LT.ABS(A*EP)) GO TO 70                              ACCUM182
      NVALS(K,1)=3HYES                                               ACCUM183
      IVALS(K,1,1)=N                                                 ACCUM184
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      IVALS(K,2,1)=ML                                                    ACCUM185
   70 IF (DIRT.NE.5HCRACK) GO TO 80                                      ACCUM186
C                                                                        ACCUM187
C     CHECK TENSILE STRESS                                               ACCUM188
C                                                                        ACCUM189
      A=STTEMS(K)                                                        ACCUM190
      IF (ABS(S).LT.ABS(A*SP)) GO TO 90                                  ACCUM191
      NVALS(K,2)=3HYES                                                   ACCUM192
      IVALS(K,1,2)=N                                                     ACCUM193
      IVALS(K,2,2)=ML                                                    ACCUM194
      GO TO 90                                                           ACCUM195
   80 IF (DIRT.NE.5HCRUSH) GO TO 90                                      ACCUM196
C                                                                        ACCUM197
C     CHECK COMPRESSIVE STRESS                                           ACCUM198
C                                                                        ACCUM199
      A=STCEMS(K)                                                        ACCUM200
      IF (ABS(S).LT.ABS(A*SP)) GO TO 90                                  ACCUM201
      NVALS(K,3)=3HYES                                                   ACCUM202
      IVALS(K,1,3)=N                                                     ACCUM203
      IVALS(K,2,3)=ML                                                    ACCUM204
   90 CONTINUE                                                           ACCUM205
C                                                                        ACCUM206
C     SUM CRACKED, CRUSHED AND YIELDED LAYERS                            ACCUM207
C                                                                        ACCUM208
      IF (AFT(ML).EQ.5HCRACK.OR.AST(ML).EQ.5HCRACK) NLK(K)=NLK(K)+1      ACCUM209
      IF (AFT(ML).EQ.5HCRUSH.OR.AST(ML).EQ.5HCRUSH) NLH(K)=NLH(K)+1      ACCUM210
      IF (AFT(ML).EQ.5HYIELD) NLK(K)=NLK(K)+1                            ACCUM211
C                                                                        ACCUM212
  100 CONTINUE                                                           ACCUM213
      WRITE (5) SXXOT,SYYOT,SXYOT                                        ACCUM214
C                                                                        ACCUM215
C     CHECK NUMBER OF CRACKED,CRUSHED OR YIELDED LAYERS                  ACCUM216
C                                                                        ACCUM217
      I=NSMAT+1                                                          ACCUM218
      DO 120 K=1,I                                                       ACCUM219
      IF (K.GT.1) GO TO 110                                              ACCUM220
C                                                                        ACCUM221
C     CHECK CRUSHED LAYERS                                               ACCUM222
C                                                                        ACCUM223
      IF (NLH(K).LT.NHS(K)) GO TO 110                                    ACCUM224
      NVALS(K,5)=3HYES                                                   ACCUM225
      IVALS(K,1,5)=N                                                     ACCUM226
C                                                                        ACCUM227
C     CHECK  CRACKED OR YIELDED LAYERS                                   ACCUM228
C                                                                        ACCUM229
  110 IF (NLK(K).LT.NKS(K)) GO TO 120                                    ACCUM230
      NVALS(K,4)=3HYES                                                   ACCUM231
      IVALS(K,1,4)=N                                                     ACCUM232
  120 CONTINUE                                                           ACCUM233
C                                                                        ACCUM234
      DO 200 K=1,2                                                       ACCUM235
      IF (ACR(K).EQ.0.) GO TO 200                                        ACCUM236
C                                                                        ACCUM237
C     CHOOSE TOP OR BOTTOM CONCRETE LAYER                                ACCUM238
C                                                                        ACCUM239
      I=1                                                                ACCUM240
      LP=0                                                               ACCUM241
      IF (K.EQ.1) LP=NULAY+1                                             ACCUM242
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      ML=I*(-1)**K+LP                                                   ACCUM243
C                                                                       ACCUM244
C     CHECK FOR CRACKS                                                  ACCUM245
C     AND ASSIGN ANGLES                                                 ACCUM246
C                                                                       ACCUM247
      ANC(1)=999.0                                                      ACCUM248
      ANC(2)=999.0                                                      ACCUM249
      ANG=999.                                                          ACCUM250
C                                                                       ACCUM251
      IF (AFT(ML).NE.5HCRACK) GO TO 130                                 ACCUM252
      ANC(1)=AF(N,ML)                                                   ACCUM253
      ANG=AS1(N,ML)                                                     ACCUM254
  130 CONTINUE                                                          ACCUM255
      IF (AST(ML).NE.5HCRACK) GO TO 140                                 ACCUM256
      ANC(2)=AS(N,ML)                                                   ACCUM257
      ANG=AS1(N,ML)                                                     ACCUM258
  140 CONTINUE                                                          ACCUM259
C                                                                       ACCUM260
C     GO TO ANOTHER LAYER IF NO CRACKS                                  ACCUM261
C                                                                       ACCUM262
      IF (ANG.EQ.999.) GO TO 200                                        ACCUM263
C                                                                       ACCUM264
C     THERE IS A CRACK                                                  ACCUM265
C                                                                       ACCUM266
      SUR=4HTOP                                                         ACCUM267
      IF (K.EQ.1) SUR=4HBOT.                                            ACCUM268
      IF (ANG.LT.0.) ANG=ANG+180.                                       ACCUM269
C                                                                       ACCUM270
C     CHOOSE DIRECTION 1 OR 2                                           ACCUM271
C                                                                       ACCUM272
      DO 190 ID=1,2                                                     ACCUM273
      NC=0                                                              ACCUM274
      ANGT=ANC(ID)                                                      ACCUM275
      IF (ANGT.EQ.999.0) GO TO 190                                      ACCUM276
      IF (ANGT.LT.0.) ANGT=ANGT+180.                                    ACCUM277
C                                                                       ACCUM278
C     FIND CRACK DEPTH                                                  ACCUM279
C                                                                       ACCUM280
      DO 160 I=1,NULAY                                                  ACCUM281
      ML=I*(-1)**(K)+LP                                                 ACCUM282
      NCC=NC                                                            ACCUM283
C                                                                       ACCUM284
      IF (AFT(ML).NE.5HCRACK) GO TO 150                                 ACCUM285
      TEST=AF(N,ML)                                                     ACCUM286
      IF (TEST.LT.0.0) TEST=TEST+180.                                   ACCUM287
      IF (TEST.LE.(ANGT+45.0).AND.TEST.GE.(ANGT-45.0)) NC=NC+1          ACCUM288
      IF (NCC.EQ.NC) GO TO 150                                          ACCUM289
      GO TO 160                                                         ACCUM290
C                                                                       ACCUM291
  150 IF (AST(ML).NE.5HCRACK) GO TO 170                                 ACCUM292
      TEST=AS(N,ML)                                                     ACCUM293
      IF (TEST.LT.0.0) TEST=TEST+180.                                   ACCUM294
      IF (TEST.LE.(ANGT+45.0).AND.TEST.GE.(ANGT-45.0)) NC=NC+1          ACCUM295
      IF (NCC.EQ.NC) GO TO 170                                          ACCUM296
C                                                                       ACCUM297
C     GO TO ANOTHER CONCRETE LAYER AND CHECK FOR CRACK                  ACCUM298
C                                                                       ACCUM299
  160 CONTINUE                                                          ACCUM300
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  170 CONTINUE                                                          ACCUM301
C                                                                       ACCUM302
C     END OF CRACK                                                      ACCUM303
C                                                                       ACCUM304
C     FIND CRACK DIRECTION WITH RESPECT TO PRINCIPAL ANGLE              ACCUM305
C                                                                       ACCUM306
      M=2                                                               ACCUM307
      IF (ANGT.NE.ANG) M=1                                              ACCUM308
C                                                                       ACCUM309
C     COMPUTE CRACK DEPTH                                               ACCUM310
C                                                                       ACCUM311
      A=NULAY                                                           ACCUM312
      HC=NC                                                             ACCUM313
      HC=HC*DT/A                                                        ACCUM314
C                                                                       ACCUM315
C     COMPUTE CRACK WIDTH                                               ACCUM316
C                                                                       ACCUM317
      A=2.+4.25*(ACR(K)-CMIN(K))/HC                                     ACCUM318
      A=ACR(K)*9.0*EM(M,K)/A                                            ACCUM319
C                                                                       ACCUM320
C     CHECK ALLOWABLE CRACK WIDTH                                       ACCUM321
      IF (A.LT.W.OR.A.LT.WCMAX(K)) GO TO 180                            ACCUM322
      IF (A.LT.W) GO TO 190                                             ACCUM323
      W=A                                                               ACCUM324
      NW=N                                                              ACCUM325
      SURC=SUR                                                          ACCUM326
      DC=ANGT                                                           ACCUM327
C                                                                       ACCUM328
  180 IF (A.LT.WM) GO TO 190                                            ACCUM329
      WM=A                                                              ACCUM330
      NWM=N                                                             ACCUM331
      SURCM=SUR                                                         ACCUM332
      DCM=ANGT                                                          ACCUM333
C                                                                       ACCUM334
C     GO TO NEW DIRECTION                                               ACCUM335
C                                                                       ACCUM336
  190 CONTINUE                                                          ACCUM337
C                                                                       ACCUM338
C     GO TO NEW SUFACE                                                  ACCUM339
C                                                                       ACCUM340
  200 CONTINUE                                                          ACCUM341
C                                                                       ACCUM342
      IF (W.NE.0.0) GO TO 210                                           ACCUM343
      W=WM                                                              ACCUM344
      NW=NWM                                                            ACCUM345
      DC=DCM                                                            ACCUM346
      SURC=SURCM                                                        ACCUM347
  210 CONTINUE                                                          ACCUM348
C                                                                       ACCUM349
  220 CONTINUE                                                          ACCUM350
      REWIND 5                                                          ACCUM351
      REWIND 21                                                         ACCUM352
      CALL FTNCOPY (4LJUM5,3LJ21,0)                                     ACCUM353
      DO 230 I=1,NA1                                                    ACCUM354
      DISPLA(I)=DISPLA(I)+DISP(I)                                       ACCUM355
      FORCEA(I)=FORCEA(I)+FORCE(I)                                      ACCUM356
  230 CONTINUE                                                          ACCUM357
C                                                                       ACCUM358
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      IF (NBEAMX.EQ.0) RETURN                                          ACCUM359
      REWIND 5                                                         ACCUM360
      DO 310 N=1,NBEAMX                                                ACCUM361
      READ (15) SIBXXA                                                 ACCUM362
      READ (23) SIBXXC                                                 ACCUM363
C                                                                      ACCUM364
C     READ INFORMATION USED IN TERMINATION CHECKS                      ACCUM365
C                                                                      ACCUM366
      READ (25) EPSPS                                                  ACCUM367
      READ (27) XLNGTH,GKEI,NPIX,NPKX,ITYPE,DUM,DUM,ZCRD,DUM           ACCUM368
C                                                                      ACCUM369
      DO 240 I=1,KMAT                                                  ACCUM370
      NLK(I)=0                                                         ACCUM371
  240 NLH(I)=0                                                         ACCUM372
C                                                                      ACCUM373
      II=5*NPIX                                                        ACCUM374
      KK=5*NPKX                                                        ACCUM375
C                                                                      ACCUM376
      DO 290 ML=1,NULAYS                                               ACCUM377
      SIBXXA(ML)=SIBXXA(ML)+SIBXXC(ML)                                 ACCUM378
C                                                                      ACCUM379
      SIG=SIBXXA(ML)                                                   ACCUM380
      K=ITYPE(ML)                                                      ACCUM381
      ES=ESX(ML,N)                                                     ACCUM382
      ZCR=ZCRD(ML)                                                     ACCUM383
C                                                                      ACCUM384
      UI=DISPLA(II-4)+DISP(II-4)                                       ACCUM385
      UK=DISPLA(KK-4)+DISP(KK-4)                                       ACCUM386
      THETAI=DISPLA(II)+DISP(II)                                       ACCUM387
      THETAK=DISPLA(KK)+DISP(KK)                                       ACCUM388
      EPS=(UK-UI+(THETAK-THETAI)*ZCR)/XLNGTH                           ACCUM389
      EPS=EPS+EPSPS(ML)                                                ACCUM390
C                                                                      ACCUM391
C     CHECK STRAIN                                                     ACCUM392
C                                                                      ACCUM393
      IF (ABS(EPS).LT.STRAMX(K)) GO TO 250                             ACCUM394
      NVALB(K,1)=3HYES                                                 ACCUM395
      IVALB(K,1,1)=N                                                   ACCUM396
      IVALB(K,2,1)=ML                                                  ACCUM397
C                                                                      ACCUM398
  250 IF (SIG.LT.0.0) GO TO 260                                        ACCUM399
C                                                                      ACCUM400
C     CHECK TENSILE STRESS                                             ACCUM401
C                                                                      ACCUM402
      IF (SIG.LT.STTEMX(K)) GO TO 270                                  ACCUM403
      NVALB(K,2)=3HYES                                                 ACCUM404
      IVALB(K,1,2)=N                                                   ACCUM405
      IVALB(K,2,2)=ML                                                  ACCUM406
C                                                                      ACCUM407
C     CHECK COMPRESSIVE STRESS                                         ACCUM408
C                                                                      ACCUM409
  260 IF (ABS(SIG).LT.STCEMX(K)) GO TO 270                             ACCUM410
      NVALB(K,3)=3HYES                                                 ACCUM411
      IVALB(K,1,3)=N                                                   ACCUM412
      IVALB(K,2,3)=ML                                                  ACCUM413
  270 CONTINUE                                                         ACCUM414
C                                                                      ACCUM415
C     SUM CRACKED, CRUSHED AND YIELDED LAYERS                          ACCUM416
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C                                                                       ACCUM417
      IF (K.GT.KC) GO TO 280                                            ACCUM418
      IF (ES.EQ.0.0.AND.SIG.LT.0.0) NLH(K)=NLH(K)+1                     ACCUM419
      IF (ES.EQ.0.0.AND.SIG.GE.0.0) NLK(K)=NLK(K)+1                     ACCUM420
      GO TO 290                                                         ACCUM421
  280 IF (ABS(SIG).GE.FT(K).OR.ABS(SIG).GE.SIGO(K)) NLK(K)=NLK(K)+1     ACCUM422
C                                                                       ACCUM423
C                                                                       ACCUM424
  290 CONTINUE                                                          ACCUM425
      WRITE (5) SIBXXA                                                  ACCUM426
C                                                                       ACCUM427
C                                                                       ACCUM428
      DO 310 I=1,KMAT                                                   ACCUM429
      IF (I.GT.KC) GO TO 300                                            ACCUM430
C                                                                       ACCUM431
C     CHECK NUMBER OF CRUSHED LAYERS                                    ACCUM432
C                                                                       ACCUM433
      IF (NLH(I).LT.NH(I)) GO TO 300                                    ACCUM434
      NVALB(K,5)=3HYES                                                  ACCUM435
      IVALB(K,1,5)=N                                                    ACCUM436
C                                                                       ACCUM437
C     CHECK NUMBER OF CRACKED LAYERS OR YIELDED LAYERS                  ACCUM438
C                                                                       ACCUM439
  300 IF (NLK(I).LT.NK(I)) GO TO 310                                    ACCUM440
      NVALB(K,4)=3HYES                                                  ACCUM441
      IVALB(K,1,4)=N                                                    ACCUM442
C                                                                       ACCUM443
  310 CONTINUE                                                          ACCUM444
      REWIND 5                                                          ACCUM445
      REWIND 15                                                         ACCUM446
      CALL FTNCOPY (4LJUM5,3LJ15,0)                                     ACCUM447
      RETURN                                                            ACCUM448
      END                                                               ACCUM449
      SUBROUTINE BEAMC (NBEAMX,NULAYB,NA1,EIB,CUB,SIBXXA,SIBXXC,EPSPS,ITBEAMC   2
     1YPE,ASXLR,AILR,KC,ZCRD,TSHEAR,ESX,DISPLA)                         BEAMC   3
C                                                                       BEAMC   4
C     COMPUTE CRACK WIDTH ON BOTTOM SUFACE OF CRITICAL BEAM ELEMENT     BEAMC   5
C                                                                       BEAMC   6
      COMMON /CRWB/ TC,M,TS,AE,NEL,ML,MLS,FSO,WBMAX,WC                  BEAMC   7
C                                                                       BEAMC   8
      DIMENSION CUB(NBEAMX), EIB(NBEAMX), SIBXXA(NULAYB), SIBXXC(NULAYB)BEAMC   9
     1, EPSPS(NULAYB), ITYPE(NULAYB), ASXLR(NULAYB), AILR(NULAYB), ZCRD(BEAMC  10
     2NULAYB), TSHEAR(NULAYB), ESX(NULAYB,NBEAMX), DISPLA(NA1)          BEAMC  11
C                                                                       BEAMC  12
C     INITIALIZE                                                        BEAMC  13
C                                                                       BEAMC  14
      WC=0.                                                             BEAMC  15
C                                                                       BEAMC  16
C     CHECK TO SEE IF INITIAL STEEL STRESS IS TO BE FOUND               BEAMC  17
C                                                                       BEAMC  18
      IF (FSO.NE.-999.0) GO TO 130                                      BEAMC  19
C                                                                       BEAMC  20
C     FIND CRITICAL BEAM ELEMENT, NEL                                   BEAMC  21
C                                                                       BEAMC  22
      NEL=0                                                             BEAMC  23
      A=0.                                                              BEAMC  24
      DO 10 I=1,NBEAMX                                                  BEAMC  25
      IF (A.GT.CUB(I)) GO TO 10                                         BEAMC  26
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      NEL=I                                                              BEAMC 27
      A=CUB(I)                                                           BEAMC 28
   10 CONTINUE                                                           BEAMC 29
      IF (NEL.EQ.0) RETURN                                               BEAMC 30
C                                                                        BEAMC 31
C     REWIND DATA TAPES                                                  BEAMC 32
C                                                                        BEAMC 33
      REWIND 15                                                          BEAMC 34
      REWIND 23                                                          BEAMC 35
      REWIND 25                                                          BEAMC 36
      REWIND 27                                                          BEAMC 37
C                                                                        BEAMC 38
C     SET UP DATA VALUES FOR ELEMENT NEL                                 BEAMC 39
C                                                                        BEAMC 40
      DO 20 I=1,NEL                                                      BEAMC 41
      READ (15) SIBXXA                                                   BEAMC 42
      READ (23) SIBXXC                                                   BEAMC 43
      READ (25) EPSPS                                                    BEAMC 44
      READ (27) XLNGTH,GKEIX,NPIX,NPKX,ITYPE,ASXLR,AILR,ZCRD,TSHEAR      BEAMC 45
   20 CONTINUE                                                           BEAMC 46
C                                                                        BEAMC 47
C     FIND THE CRITICAL CONCRETE LAYER, ML                               BEAMC 48
C                                                                        BEAMC 49
      ML=0                                                               BEAMC 50
      A=-999.                                                            BEAMC 51
      DO 30 I=1,NULAYB                                                   BEAMC 52
      IF (ITYPE(I).GT.KC) GO TO 30                                       BEAMC 53
      IF (A.GE.ZCRD(I)) GO TO 30                                         BEAMC 54
      A=ZCRD(I)                                                          BEAMC 55
      ML=I                                                               BEAMC 56
   30 CONTINUE                                                           BEAMC 57
      IF (ML.NE.0) GO TO 40                                              BEAMC 58
      M=0                                                                BEAMC 59
      RETURN                                                             BEAMC 60
   40 CONTINUE                                                           BEAMC 61
C                                                                        BEAMC 62
C     CHECK IF CONCRETE STRAIN IS TENSILE                                BEAMC 63
C                                                                        BEAMC 64
      I=5*NPIX                                                           BEAMC 65
      K=5*NPKX                                                           BEAMC 66
      EB=DISPLA(K-4)-DISPLA(I-4)+(DISPLA(K)-DISPLA(I))*ZCRD(ML)          BEAMC 67
      EB=EB/XLNGTH+EPSPS(ML)                                             BEAMC 68
      EA=EIB(NEL)+CUB(NEL)*ZCRD(ML)                                      BEAMC 69
      IF (EA.EQ.0.) RETURN                                               BEAMC 70
      IF ((EA+EB).LT.0.0) RETURN                                         BEAMC 71
C                                                                        BEAMC 72
C     FIND CRITICAL STEEL LAYER, MLS                                     BEAMC 73
C                                                                        BEAMC 74
      A=-999.0                                                           BEAMC 75
      MLS=0                                                              BEAMC 76
      DO 50 I=1,NULAYB                                                   BEAMC 77
      IF (ITYPE(I).LE.KC) GO TO 50                                       BEAMC 78
      IF (A.GE.ZCRD(I)) GO TO 50                                         BEAMC 79
      A=ZCRD(I)                                                          BEAMC 80
      MLS=I                                                              BEAMC 81
   50 CONTINUE                                                           BEAMC 82
      IF (MLS.NE.0) GO TO 60                                             BEAMC 83
      M=0                                                                BEAMC 84
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      RETURN                                                            BEAMC 85
   60 CONTINUE                                                          BEAMC 86
C                                                                       BEAMC 87
C     DEFINE STEEL CENTROID LOCATION, TS , MEASURED FROM BOTTOM         BEAMC 88
C                                                                       BEAMC 89
      A=0.                                                              BEAMC 90
      B=0.0                                                             BEAMC 91
      DO 70 I=1,NULAYB                                                  BEAMC 92
      IF (ITYPE(I).LE.KC) GO TO 70                                      BEAMC 93
      A=A+ZCRD(I)*ASXLR(I)*ESX(I,NEL)                                   BEAMC 94
      B=B+ASXLR(I)*ESX(I,NEL)                                           BEAMC 95
   70 CONTINUE                                                          BEAMC 96
      IF (B.EQ.0.) GO TO 80                                             BEAMC 97
      TSZ=A/B                                                           BEAMC 98
      TS=ZCRD(ML)+ASXLR(ML)/TSHEAR(ML)/2.-TSZ                           BEAMC 99
      IF (TS.GE.0.) GO TO 90                                            BEAMC100
   80 CONTINUE                                                          BEAMC101
      M=0                                                               BEAMC102
      RETURN                                                            BEAMC103
   90 CONTINUE                                                          BEAMC104
C                                                                       BEAMC105
C     DEFINE THE CONCRETE LAYER WIDTH, TW, AT THE STEEL CENTROID        BEAMC106
C                                                                       BEAMC107
      A=0.                                                              BEAMC108
      B=0.                                                              BEAMC109
      DO 110 I=1,NULAYB                                                 BEAMC110
C                                                                       BEAMC111
C     CHECK IF LAYER IS STEEL                                           BEAMC112
C                                                                       BEAMC113
      IF (ITYPE(I).LE.KC) GO TO 110                                     BEAMC114
C                                                                       BEAMC115
C     FIND CONCRETE LAYER WIDTH AT STEEL LAYER CENTROID                 BEAMC116
C                                                                       BEAMC117
      DO 100 K=1,NULAYB                                                 BEAMC118
      IF (ITYPE(K).GT.KC) GO TO 100                                     BEAMC119
      TL=ASXLR(K)/TSHEAR(K)                                             BEAMC120
      IF ((ZCRD(K)+TL/2.).LT.ZCRD(I)) GO TO 100                         BEAMC121
      IF ((ZCRD(K)-TL/2.).GE.ZCRD(I)) GO TO 100                         BEAMC122
      B=B+ASXLR(I)*ESX(I,NEL)                                           BEAMC123
      A=A+TSHEAR(K)*ASXLR(I)*ESX(I,NEL)                                 BEAMC124
      GO TO 110                                                         BEAMC125
  100 CONTINUE                                                          BEAMC126
C                                                                       BEAMC127
C     FIND NEW STEEL LAYER                                              BEAMC128
C                                                                       BEAMC129
  110 CONTINUE                                                          BEAMC130
      IF (B.GT.0.) GO TO 120                                            BEAMC131
      M=0                                                               BEAMC132
      RETURN                                                            BEAMC133
  120 CONTINUE                                                          BEAMC134
C                                                                       BEAMC135
C     COMPUTE EFFECTIVE CONCRETE WIDTH                                  BEAMC136
C                                                                       BEAMC137
      TW=A/B                                                            BEAMC138
C                                                                       BEAMC139
C     COMPUTE EFFECTIVE CONCRETE AREA SYMMETRICAL ABOUT STEEL  C.G.     BEAMC140
C                                                                       BEAMC141
      AE=2.*TW*TS                                                       BEAMC142
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C                                                                       BEAMC143
C     FIND THE STEEL STRAIN AT ZERO CONCRETE STRAIN                     BEAMC144
C                                                                       BEAMC145
      I=5*NPIX                                                          BEAMC146
      K=5*NPKX                                                          BEAMC147
      B=EIB(NEL)+CUB(NEL)*ZCRD(MLS)                                     BEAMC148
      A=DISPLA(K-4)-DISPLA(I-4)+(DISPLA(K)-DISPLA(I))*ZCRD(MLS)         BEAMC149
      A=A/XLNGTH+EPSPS(ML)                                              BEAMC150
      A=A+B                                                             BEAMC151
      FSO=A-(EA+EB)*B/EA                                                BEAMC152
C                                                                       BEAMC153
C                                                                       BEAMC154
C     CHECK BEAM CRACK WIDTH  FOR ELEMENT NEL                           BEAMC155
C                                                                       BEAMC156
  130 CONTINUE                                                          BEAMC157
      IF (ESX(ML,NEL).NE.0.) RETURN                                     BEAMC158
C                                                                       BEAMC159
C     FIND DATA VALUES FOR CRTITICAL ELEMENT                            BEAMC160
C                                                                       BEAMC161
      REWIND 15                                                         BEAMC162
      REWIND 23                                                         BEAMC163
      REWIND 25                                                         BEAMC164
      REWIND 27                                                         BEAMC165
      DO 140 I=1,NEL                                                    BEAMC166
      READ (15) SIBXXA                                                  BEAMC167
      READ (23) SIBXXC                                                  BEAMC168
      READ (25) EPSPS                                                   BEAMC169
      READ (27) XLNGTH,GKEIX,NPIX,NPKX,ITYPE,ASXLR,AILR,ZCRD,TSHEAR     BEAMC170
  140 CONTINUE                                                          BEAMC171
C                                                                       BEAMC172
C     CHECK FOR TENSILE STRAIN                                          BEAMC173
C                                                                       BEAMC174
      I=5*NPIX                                                          BEAMC175
      K=5*NPKX                                                          BEAMC176
      A=DISPLA(K-4)-DISPLA(I-4)                                         BEAMC177
      B=DISPLA(K)-DISPLA(I)                                             BEAMC178
C                                                                       BEAMC179
      EA=(A+B*ZCRD(MLS))/XLNGTH+EPSPS(MLS)                              BEAMC180
      EA=EA+EIB(NEL)+CUB(NEL)*ZCRD(MLS)                                 BEAMC181
      IF ((EA-FSO).LT.0.0) RETURN                                       BEAMC182
C                                                                       BEAMC183
      EA=(A+B*ZCRD(ML))/XLNGTH+EPSPS(ML)                                BEAMC184
      EA=EA+EIB(NEL)+CUB(NEL)*ZCRD(ML)                                  BEAMC185
      IF (EA.LT.0.) RETURN                                              BEAMC186
C                                                                       BEAMC187
C     FIND NEUTRAL AXIS                                                 BEAMC188
C                                                                       BEAMC189
      I=0                                                               BEAMC190
  150 I=I+1                                                             BEAMC191
      IF (I.GT.NULAYB) M=0                                              BEAMC192
      IF (I.GT.NULAYB) RETURN                                           BEAMC193
      IF (I.EQ.ML.OR.ITYPE(I).GT.KC.OR.ASXLR(I).EQ.0.0) GO TO 150       BEAMC194
C                                                                       BEAMC195
      EB=(A+B*ZCRD(I))/XLNGTH+EPSPS(I)                                  BEAMC196
      EB=EB+EIB(NEL)+CUB(NEL)*ZCRD(I)                                   BEAMC197
      IF (EA.EQ.EB) EA=EA+EA*1.0E-06                                    BEAMC198
      ZNA=ZCRD(ML)-EA*(ZCRD(ML)-ZCRD(I))/(EA-EB)                        BEAMC199
C                                                                       BEAMC200
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C      COMPUTE CRACK WIDTH                                                    BEAMC201
C                                                                             BEAMC202
       H2=ZCRD(ML)+ASXLR(ML)/TSHEAR(ML)/2.                                    BEAMC203
       H2=H2-ZNA                                                              BEAMC204
       IF (H2.EQ.TS) H2=H2+H2*1.E-06                                          BEAMC205
       R=1.+TS/(H2-TS)                                                        BEAMC206
       RM=M                                                                   BEAMC207
       EA=(A+B*ZCRD(MLS))/XLNGTH+EPSPS(MLS)                                   BEAMC208
       EA=EA+EIB(NEL)+CUB(NEL)*ZCRD(MLS)                                      BEAMC209
       B=(EA-FSO)*ESX(MLS,NEL)                                                BEAMC210
       WC=0.091*1.6*R*(TC*AE/RM)**(1.0/3.0)*B/1000.                           BEAMC211
C                                                                             BEAMC212
       RETURN                                                                 BEAMC213
       END                                                                    BEAMC214
       SUBROUTINE QPRINT (HDISP,HFORC,RDISP,RFORC,RDFPR,NSLAYR,NULAY,NCNSQPRINT 2
      1,NUMEL,AFT,AST,AS1,NA1,NUMNP,IO,FORCEA,DISPLA)                         QPRINT 3
       DIMENSION FORCEA(NA1), DISPLA(NA1)                                     QPRINT 4
       DIMENSION AFT(NCNS), AST(NCNS), AS1(NUMEL,NCNS)                        QPRINT 5
       COMMON /SMX/ OLOAD,PMAX                                                QPRINT 6
C                                                                             QPRINT 7
       COMMON /HIST/ NVAL(10),IVAL(10),FVAL(10)                               QPRINT 8
       COMMON /PLTCD/ PLTCRD                                                  QPRINT 9
       COMMON /SIGNIF/ NSIGNI(2)                                              QPRINT10
C                                                                             QPRINT11
       IF (RDFPR.NE.3HYES) GO TO 70                                           QPRINT12
       WRITE (IO,10)                                                          QPRINT13
    10 FORMAT (//,1H0,10X,*APPLIED NODAL POINT FORCES IN KIPS AND IN-KIPSQPRINT14
      1*,//)                                                                  QPRINT15
       WRITE (IO,20)                                                          QPRINT16
    20 FORMAT (1H0,5X,*NODAL POINTS*,8X,*U-LOAD*,11X,*V-LOAD*,12X,*W-LOADQPRINT17
      1*,12X,*MX-LOAD*,11X,*MY-LOAD*,//)                                     QPRINT18
       WRITE (IO,30) (M,FORCEA(5*M-4),FORCEA(5*M-3),FORCEA(5*M-2),FORCEA(QPRINT19
      15*M-1),FORCEA(5*M),M=1,NUMNP)                                          QPRINT20
    30 FORMAT (6X,I5,2X,5F18.5)                                               QPRINT21
C                                                                             QPRINT22
       WRITE (IO,40)                                                          QPRINT23
    40 FORMAT (//,1H0,10X,*NODAL POINT DISPLACEMENTS IN INCHES AND RADIANQPRINT24
      1S*,//)                                                                 QPRINT25
       WRITE (IO,50)                                                          QPRINT26
    50 FORMAT (1H0,5X,*NODAL POINTS*,8X,*U-DISP*,11X,*V-DISP*,12X,*W-DISPQPRINT27
      1*,12X,*MX-DISP*,11X,*MY-DISP*,//)                                      QPRINT28
       WRITE (IO,60) (M,DISPLA(5*M-4),DISPLA(5*M-3),DISPLA(5*M-2),DISPLA(QPRINT29
      15*M-1),DISPLA(5*M),M=1,NUMNP)                                          QPRINT30
    60 FORMAT (6X,I5,2X,5F18.5)                                               QPRINT31
C                                                                             QPRINT32
    70 CONTINUE                                                               QPRINT33
C                                                                             QPRINT34
C      PRINT REFERENCE VALUES                                                 QPRINT35
C                                                                             QPRINT36
       LL=NSIGNI(2)                                                           QPRINT37
       A=DISPLA(LL)/HDISP                                                     QPRINT38
       WRITE (IO,80) A                                                        QPRINT39
    80 FORMAT (1H0,//,20X,*DISPLACEMENT/REFERENCE DISPLACEMENT =*,F11.5)      QPRINT40
C                                                                             QPRINT41
       LL=NSIGNI(1)                                                           QPRINT42
       A=FORCEA(LL)/HFORC                                                     QPRINT43
       WRITE (IO,90) A                                                        QPRINT44
    90 FORMAT (1H0,19X,*FORCE/REFERENCE FORCE                =*,F11.5)        QPRINT45
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C                                                                       QPRINT46
C     FIND SUM OF VERTICAL NODAL POINT LOADS                            QPRINT47
C                                                                       QPRINT48
      A=0.                                                              QPRINT49
      DO 100 I=1,NUMNP                                                  QPRINT50
      J=I*5-2                                                           QPRINT51
      A=FORCEA(J)+A                                                     QPRINT52
  100 CONTINUE                                                          QPRINT53
      WRITE (IO,110) A                                                  QPRINT54
  110 FORMAT (1H0,19X,*SUM OF NODAL POINT W-LOADS          =*,F11.4)    QPRINT55
C                                                                       QPRINT56
C     SET UP HISTOGRAM                                                  QPRINT57
C                                                                       QPRINT58
      IF (ABS(A/OLOAD).GT.PMAX) NVAL(4)=3HYES                           QPRINT59
      FVAL(7)=A/OLOAD                                                   QPRINT60
C                                                                       QPRINT61
      REWIND 32                                                         QPRINT62
      DO 150 N=1,NUMEL                                                  QPRINT63
      READ (32) AFT,AST                                                 QPRINT64
C                                                                       QPRINT65
      DO 130 M=1,NULAY                                                  QPRINT66
      IF (AS1(N,M).EQ.999.0) GO TO 130                                  QPRINT67
      IF (FVAL(1).NE.-999.0) GO TO 120                                  QPRINT68
      IF (AFT(M).EQ.5HCRACK.OR.AST(M).EQ.5HCRACK) FVAL(1)=A             QPRINT69
  120 IF (FVAL(2).NE.-999.0) GO TO 130                                  QPRINT70
      IF (AFT(M).EQ.5HCRUSH.OR.AST(M).EQ.5HCRUSH) FVAL(2)=A             QPRINT71
  130 CONTINUE                                                          QPRINT72
C                                                                       QPRINT73
      IF (NSLAYR.EQ.0) GO TO 150                                        QPRINT74
      I=NULAY+1                                                         QPRINT75
      DO 140 M=I,NCNS                                                   QPRINT76
      IF (AS1(N,M).EQ.999.0) GO TO 140                                  QPRINT77
      IF (FVAL(3).NE.-999.0) GO TO 140                                  QPRINT78
      IF (AFT(M).EQ.5HYIELD) FVAL(3)=A                                  QPRINT79
  140 CONTINUE                                                          QPRINT80
C                                                                       QPRINT81
  150 CONTINUE                                                          QPRINT82
C                                                                       QPRINT83
C                                                                       QPRINT84
      IF (FVAL(4).EQ.+999.0) FVAL(4)=A                                  QPRINT85
      IF (FVAL(5).EQ.+999.0) FVAL(5)=A                                  QPRINT86
      IF (FVAL(6).EQ.+999.0) FVAL(6)=A                                  QPRINT87
C                                                                       QPRINT88
C     WRITE PLOT CARDS                                                  QPRINT89
C                                                                       QPRINT90
      IF (PLTCRD.NE.3HYES) RETURN                                       QPRINT91
      WRITE (8,160) (M,FORCEA(5*M-2),DISPLA(5*M-2),M=1,NUMNP)           QPRINT92
  160 FORMAT (3(I2,E12.5,E12.5),2X)                                     QPRINT93
C                                                                       QPRINT94
      RETURN                                                            QPRINT95
      END                                                               QPRINT96
      SUBROUTINE PRISRB (SIEXXC,IN,NULAYB,NBEAMX,IO)                    PRISRB 2
C                                                                       PRISRB 3
C     THIS SUBROUTINE PRINTS BEAM STRESSES                              PRISRB 4
C                                                                       PRISRB 5
      DIMENSION SIBXXC(NULAYB)                                          PRISRB 6
C                                                                       PRISRB 7
      REWIND IN                                                         PRISRB 8
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C                                                                       PRISRB  9
      WRITE (IO,10) (ML,ML=1,NULAYB)                                    PRISRB10
   10 FORMAT (1H0,5X,*BEAM*,/,1H ,5X,*ELEMENT/ LAYER =*,10(I6,5X),(/,22XPRISRB11
     1,10(I6,5X)))                                                      PRISRB12
      DO 40 N=1,NBEAMX                                                  PRISRB13
      WRITE (IO,20)                                                     PRISRB14
   20 FORMAT (1H )                                                      PRISRB15
C                                                                       PRISRB16
      READ (IN) SIBXXC                                                  PRISRB17
      WRITE (IO,30) N,(SIBXXC(ML),ML=1,NULAYB)                          PRISRB18
   30 FORMAT (1H0,7X,I3,11X,10F11.3,(/,22X,10F11.3))                    PRISRB19
   40 CONTINUE                                                          PRISRB20
      WRITE (IO,20)                                                     PRISRB21
      RETURN                                                            PRISRB22
      END                                                               PRISRB23
      SUBROUTINE STOTL (IC,NCNS,NULAY,NUMEL,NSLAYR,PZC,PDT,DT,SZC,SPHI,CSTOTL  2
     1TXX,CTYY,CTXY,ETXX,ETYY,ETXY)                                     STOTL  3
C                                                                       STOTL  4
C                                                                       STOTL  5
C     THIS SUBROUTINE PRINTS X,Y AND PRINCIPAL STRAINS IN PLATE         STOTL  6
C                                                                       STOTL  7
C                                                                       STOTL  8
      DIMENSION CTXX(NUMEL), CTYY(NUMEL), CTXY(NUMEL), ETXX(NUMEL), ETYYSTOTL  9
     1(NUMEL), ETXY(NUMEL), SPHI(NSLAYR), CT(3), EE(3)                  STOTL 10
C                                                                       STOTL 11
      REWIND 28                                                         STOTL 12
C                                                                       STOTL 13
      WRITE (IO,10)                                                     STOTL 14
   10 FORMAT (//)                                                       STOTL 15
      WRITE (IO,20)                                                     STOTL 16
   20 FORMAT (//10X,*TOTAL ACCUMULATED STRAIN IN PLATE LAYERS*,/)       STOTL 17
      WRITE (IO,10)                                                     STOTL 18
      WRITE (IO,30)                                                     STOTL 19
   30 FORMAT (//6X,4HN ML,9X,5HEXXOT,9X,5HEYYOT,7X,8H   EXYOT,10X,2HE1,1STOTL 20
     12X,2HE2,10X,6HTHETA1)                                             STOTL 21
      DO 70 N=1,NUMEL                                                   STOTL 22
C                                                                       STOTL 23
      READ (28) DT,EX,EX,EX,EX,EX,EX                                    STOTL 24
C                                                                       STOTL 25
      CT(1)=CTXX(N)                                                     STOTL 26
      CT(2)=CTYY(N)                                                     STOTL 27
      CT(3)=CTXY(N)                                                     STOTL 28
      WRITE (IO,10)                                                     STOTL 29
      DO 70 ML=1,NCNS                                                   STOTL 30
      CALL STRANO (N,ML,CT,EE,NULAY,NUMEL,NSLAYR,PZC,PDT,DT,SZC)        STOTL 31
      EX=ETXX(N)+EE(1)                                                  STOTL 32
      EY=ETYY(N)+EE(2)                                                  STOTL 33
      EXY=ETXY(N)+EE(3)                                                 STOTL 34
      EXY=.5*EXY                                                        STOTL 35
      IF (ML.GT.NULAY) GO TO 40                                         STOTL 36
      CALL PRNCIP (EX,EY,EXY,E1,E2,THETA)                               STOTL 37
      GO TO 50                                                          STOTL 38
   40 CONTINUE                                                          STOTL 39
      THETA=SPHI(ML-NULAY)                                              STOTL 40
      CALL TRANG (EX,EY,EXY,THETA,E1,E2,E3)                             STOTL 41
   50 CONTINUE                                                          STOTL 42
      EXY=2.0*EXY                                                       STOTL 43
      WRITE (IO,60) N,ML,EX,EY,EXY,E1,E2,THETA                          STOTL 44
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   60 FORMAT (1H ,3X,I3,1X,I2,2X,6(E12.5,2X))                          STOTL 45
   70 CONTINUE                                                         STOTL 46
      RETURN                                                           STOTL 47
      END                                                              STOTL 48
      SUBROUTINE PRISTR (SXXOT,SYYOT,SXYOT,A,IN,NULAY,NUMEL,NCNS,NSLAYR,PRISTR 2
     1SPHI,IO)                                                         PRISTR 3
C                                                                      PRISTR 4
C     PRINT SLAB STRESSES                                              PRISTR 5
C                                                                      PRISTR 6
      DIMENSION SXXOT(NCNS), SYYOT(NCNS), SXYOT(NCNS), SPHI(NSLAYR), DUMPRISTR 7
     1MY(1)                                                           PRISTR 8
C                                                                      PRISTR 9
      REWIND IN                                                        PRISTR10
C                                                                      PRISTR11
      DO 50 N=1,NUMEL                                                  PRISTR12
      READ (IN) SXXOT,SYYOT,SXYOT                                      PRISTR13
      WRITE (IO,10)                                                    PRISTR14
   10 FORMAT (//)                                                      PRISTR15
      DO 50 ML=1,NCNS                                                  PRISTR16
      SX=SXXOT(ML)                                                     PRISTR17
      SY=SYYOT(ML)                                                     PRISTR18
      SXY=SXYOT(ML)*A                                                  PRISTR19
      IF (ML.GT.NULAY) GO TO 20                                        PRISTR20
      CALL PRNCIP (SX,SY,SXY,S1,S2,THETA1)                             PRISTR21
      GO TO 30                                                         PRISTR22
   20 CONTINUE                                                         PRISTR23
      THETA1=SPHI(ML-NULAY)                                            PRISTR24
      CALL TRANG (SX,SY,SXY,THETA1,S1,S2,S3)                           PRISTR25
   30 CONTINUE                                                         PRISTR26
      WRITE (IO,40) N,ML,SX,SY,SXY,S1,S2,THETA1                        PRISTR27
   40 FORMAT (1H ,3X,I3,1X,I2,2X,6(F12.5,2X))                          PRISTR28
   50 CONTINUE                                                         PRISTR29
      RETURN                                                           PRISTR30
      END                                                              PRISTR31
      SUBROUTINE PRISTA (EIXX,EIYY,EIXY,IO,NUMEL,NULAY,NSLAYR,SPHI)    PRISTA 2
C                                                                      PRISTA 3
C     PRINT CURVATURES                                                 PRISTA 4
C     PRINT INPLANE STRAIN                                             PRISTA 5
C                                                                      PRISTA 6
      DIMENSION EIXX(NUMEL), EIYY(NUMEL), EIXY(NUMEL), SPHI(NSLAYR), DUMPRISTA 7
     1MY(1)                                                           PRISTA 8
      WRITE (IO,10)                                                    PRISTA 9
   10 FORMAT (1H )                                                     PRISTA10
      DO 40 N=1,NUMEL                                                  PRISTA11
      WRITE (IO,10)                                                    PRISTA12
      EX=EIXX(N)                                                       PRISTA13
      EY=EIYY(N)                                                       PRISTA14
      EXY=EIXY(N)                                                      PRISTA15
      EXY=0.5*EXY                                                      PRISTA16
      ML=0                                                             PRISTA17
      CALL PRNCIP (EX,EY,EXY,E1,E2,THETA)                              PRISTA18
      WRITE (IO,20) N,ML,EX,EY,EXY,E1,E2,THETA                         PRISTA19
   20 FORMAT (1H ,3X,I3,1X,I2,2X,6(E12.5,2X))                          PRISTA20
      IF (NSLAYR.EQ.0) GO TO 40                                        PRISTA21
      DO 30 I=1,NSLAYR                                                 PRISTA22
      THETA=SPHI(ML-NULAY)                                             PRISTA23
      CALL TRANG (EX,EY,EXY,THETA,E1,E2,E3)                            PRISTA24
      ML=NULAY+I                                                       PRISTA25
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      WRITE (IO,20) N,ML,EX,EY,EXY,E1,E2,THETA                          PRISTA26
   30 CONTINUE                                                          PRISTA27
   40 CONTINUE                                                          PRISTA28
      RETURN                                                            PRISTA29
      END                                                               PRISTA30
      SUBROUTINE BFORCE (NULAYB,NBEAMX,IO,DDUM,RDFPR,IST,ASXLR,SIBXXA,ZCBFORCE 2
     1RD)                                                               BFORCE 3
C                                                                       BFORCE 4
C     THIS SUBROUTINE COMPUTES MOMENTS IN BEAM ELEMENTS AND IN-         BFORCE 5
C     PLANE FORCES.                                                     BFORCE 6
C                                                                       BFORCE 7
      DIMENSION ASXLR(NULAYB), SIBXXA(NULAYB), ZCRD(NULAYB), DDUM(NULAYBBFORCE 8
     1), DUMMY(1)                                                       BFORCE 9
      COMMON /PLTCD/ PLTCRD                                             BFORCE10
C                                                                       BFORCE11
C                                                                       BFORCE12
      REWIND 27                                                         BFORCE13
      REWIND IST                                                        BFORCE14
C                                                                       BFORCE15
      IF (RDFPR.EQ.3HYES) WRITE (IO,10)                                 BFORCE16
   10 FORMAT (1H0,//,9X,*INTERNAL MOMENTS (IN-KIPS) AND NORMAL FORCES (KBFORCE17
     1IPS) IN BEAM ELEMENTS*,/,1H ,7X,*EL*,9X,*MB*,17X,*NB*,/)          BFORCE18
      DO 30 N=1,NBEAMX                                                  BFORCE19
      SUM1=0.                                                           BFORCE20
      SUM2=0.                                                           BFORCE21
C                                                                       BFORCE22
      READ (IST) SIBXXA                                                 BFORCE23
      READ (27) XLNGTH,GKEIX,NPIX,NPKX,DDUM,ASXLR,DDUM,ZCRD,DDUM        BFORCE24
C                                                                       BFORCE25
      DO 20 ML=1,NULAYB                                                 BFORCE26
      ASX=ASXLR(ML)                                                     BFORCE27
      ZCR=ZCRD(ML)                                                      BFORCE28
      SIB=SIBXXA(ML)                                                    BFORCE29
      SUM1=SUM1+ASX*SIB*ZCR                                             BFORCE30
   20 SUM2=SUM2+ASX*SIB                                                 BFORCE31
      IF (RDFPR.EQ.3HYES) WRITE (IO,40) N,SUM1,SUM2                     BFORCE32
   30 CONTINUE                                                          BFORCE33
   40 FORMAT (5X,I5,F15.4,3X,F15.4)                                     BFORCE34
      RETURN                                                            BFORCE35
      END                                                               BFORCE36
      SUBROUTINE PFORCE (IO,NUMEL,NCNS,NULAY,NSLAYR,RDFPR,IST,PZC,PDT,DTPFORCE 2
     1,SDT,SZC,SXXOT,SYYOT,SXYOT)                                       PFORCE 3
C                                                                       PFORCE 4
C     THIS SUBROUTINE COMPUTES INTERNAL MOMENTS AND NORMAL FORCES IN    PFORCE 5
C         THE SLAB ELEMENTS                                             PFORCE 6
C                                                                       PFORCE 7
      DIMENSION PDT(NULAY), PZC(NULAY), SDT(NSLAYR), SZC(NSLAYR), SXXOT(PFORCE 8
     1NCNS), SYYOT(NCNS), SXYOT(NCNS), DUMMY(1)                         PFORCE 9
      COMMON /PLTCD/ PLTCRD                                             PFORCE10
C                                                                       PFORCE11
      REWIND IST                                                        PFORCE12
      REWIND 28                                                         PFORCE13
      IF (RDFPR.EQ.3HYES) WRITE (IO,10)                                 PFORCE14
   10 FORMAT (1H0,//,10X,*INTERNAL MOMENTS (IN-KIPS/IN) AND NORMAL FORCEPFORCE15
     1S (KIPS/IN) IN THE SLAB*,//,1H ,7X,*EL*,14X,*MY*,13X,*MX *,13X,*MXPFORCE16
     2Y*,13X,*NX *,13X,*NY *,13X,*NXY*)                                 PFORCE17
      DO 70 N=1,NUMEL                                                   PFORCE18
      READ (28) DT,ELLA,ELLB,A,A,A,A                                    PFORCE19
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      READ (IST) SXXOT,SYYOT,SXYOT                                      PFORCE20
      SUM1=0.                                                           PFORCE21
      SUM2=0.                                                           PFORCE22
      SUM3=0.                                                           PFORCE23
      SUM4=0.0                                                          PFORCE24
      SUM5=0.0                                                          PFORCE25
      SUM6=0.0                                                          PFORCE26
      ABAR=(PZC(1)-PDT(1)/2.0+PZC(NULAY)+PDT(NULAY)/2.0)                PFORCE27
      ABAR=ABAR*DT/2.0                                                  PFORCE28
      DO 40 ML=1,NCNS                                                   PFORCE29
      IF (ML.GT.NULAY) GO TO 20                                         PFORCE30
      A=PDT(ML)*DT*(PZC(ML)*DT-ABAR)                                    PFORCE31
      AA=DT*PDT(ML)                                                     PFORCE32
      GO TO 30                                                          PFORCE33
   20 CONTINUE                                                          PFORCE34
      A=SDT(ML-NULAY)*(SZC(ML-NULAY)-ABAR)                              PFORCE35
      AA=SDT(ML-NULAY)                                                  PFORCE36
   30 CONTINUE                                                          PFORCE37
      SUM1=SUM1+SXXOT(ML)*A                                             PFORCE38
      SUM2=SUM2+SYYCT(ML)*A                                             PFORCE39
      SUM3=SUM3+SXYOT(ML)*A                                             PFORCE40
      SUM4=SUM4+SXXOT(ML)*AA                                            PFORCE41
      SUM5=SUM5+SYYOT(ML)*AA                                            PFORCE42
      SUM6=SUM6+SXYOT(ML)*AA                                            PFORCE43
   40 CONTINUE                                                          PFORCE44
C                                                                       PFORCE45
C                                                                       PFORCE46
      IF (RDFPR.NE.3HYES) GO TO 60                                      PFORCE47
      WRITE (IO,50) N,SUM1,SUM2,SUM3,SUM4,SUM5,SUM6                     PFORCE48
   50 FORMAT (1H ,4X,I5,6(5X,F11.3))                                    PFORCE49
   60 CONTINUE                                                          PFORCE50
   70 CONTINUE                                                          PFORCE51
      RETURN                                                            PFORCE52
      END                                                               PFORCE53
      SUBROUTINE SHEAR (NLAY,NBMS,XLNGTH,SIBXXA,ASXLR,TSHEAR,ZCRD,ITYPE,SHEAR  2
     1KC,NOBM,IO,AILR,RDFPR,XLEN,SIG,A,QQ,ITYP,TSHR,ZCR,Q,NBEAMX)       SHEAR  3
C                                                                       SHEAR  4
C     THIS SUBROUTINE COMPUTES SHEARS AND PRINCIPAL STRESSES IN         SHEAR  5
C         BEAM LAYERS                                                   SHEAR  6
C                                                                       SHEAR  7
      DIMENSION XLEN(3), SIG(NLAY,3), A(NLAY,3), ITYP(NLAY,3), TSHR(NLAYSHEAR  8
     1,3), ZCR(NLAY,3), QQ(NLAY), Q(NLAY), SIBXXA(NLAY), ASXLR(NLAY), TSSHEAR  9
     2HEAR(NLAY), ZCRD(NLAY), ITYPE(NLAY), AILR(NLAY), DUMMY(1)         SHEAR 10
C                                                                       SHEAR 11
C                                                                       SHEAR 12
      COMMON /HIST/ NVAL(10),IVAL(10),FVAL(10)                          SHEAR 13
      COMMON /SMX/ OLOAD,PMAX,SHEARM                                    SHEAR 14
      REWIND 3                                                          SHEAR 15
      REWIND 27                                                         SHEAR 16
      REWIND 4                                                          SHEAR 17
C                                                                       SHEAR 18
      IF (RDFPR.EQ.3HYES) WRITE (IO,10)                                 SHEAR 19
   10 FORMAT (/,1H0,5X,*BEAM ELEMENT   SHEAR STRESS (KSI) AT TOP*)      SHEAR 20
C                                                                       SHEAR 21
      DO 190 JOE=1,NOBM                                                 SHEAR 22
C                                                                       SHEAR 23
C     STRESS POSITIONS IN THE BEAM                                      SHEAR 24
C     ELEMENT OF INTEREST                                               SHEAR 25
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C                *                                                      SHEAR 26
C                *                                                      SHEAR 27
C     *       *    *    *       *                                       SHEAR 28
C     * EL-L  * EL-M  * EL-R  *                                         SHEAR 29
C     ************************                                         SHEAR 30
C     *   +   *   +   *   +   *                                         SHEAR 31
C     *   +   *   +   *   +   *                                         SHEAR 32
C     *   +   *   +   *   +   *                                         SHEAR 33
C     *   +SLB*SA + SB*SRA+   *   LAYER OF INTEREST                    SHEAR 34
C     *   +   *   +   *   +   *                                         SHEAR 35
C     *   +   *   +   *   +   *                                         SHEAR 36
C     ************************                                         SHEAR 37
C                                                                       SHEAR 38
      DO 190 JJ=1,NBMS                                                  SHEAR 39
      QE=0.                                                             SHEAR 40
      QS=0.                                                             SHEAR 41
      ZIE=0.                                                            SHEAR 42
      ZIS=0.                                                            SHEAR 43
      ZUE=0.                                                            SHEAR 44
C                                                                       SHEAR 45
      IS=1                                                              SHEAR 46
      IE=2                                                              SHEAR 47
C                                                                       SHEAR 48
      IF (JJ.EQ.1) GO TO 30                                             SHEAR 49
C                                                                       SHEAR 50
      IS=2                                                              SHEAR 51
      IE=1                                                              SHEAR 52
C                                                                       SHEAR 53
C     MOVE  LAYER PROPERTIES FROM MIDDLE ELEMENT TO LEFT ELEMENT        SHEAR 54
C     MOVE  LAYER PROPERTIES FROM RIGHT ELEMENT TO MIDDLE ELEMENT       SHEAR 55
C                                                                       SHEAR 56
      DO 20 KK=1,2                                                      SHEAR 57
      K=KK+1                                                            SHEAR 58
      XLEN(KK)=XLEN(K)                                                  SHEAR 59
      DO 20 I=1,NLAY                                                    SHEAR 60
      A(I,KK)=A(I,K)                                                    SHEAR 61
      SIG(I,KK)=SIG(I,K)                                                SHEAR 62
      TSHR(I,KK)=TSHR(I,K)                                              SHEAR 63
      ZCR(I,KK)=ZCR(I,K)                                                SHEAR 64
      ITYP(I,KK)=ITYP(I,K)                                              SHEAR 65
   20 CONTINUE                                                          SHEAR 66
   30 CONTINUE                                                          SHEAR 67
C                                                                       SHEAR 68
C     SET UP MIDDLE ELEMENT AND RIGHT ELEMENT IF FIRST BEAM ELEMENT     SHEAR 69
C     DO NOT READ IF LAST BEAM ELEMENT                                  SHEAR 70
C     OTHERWISE SET UP RIGHT ELEMENT                                    SHEAR 71
C                                                                       SHEAR 72
      IF (JJ.EQ.NBMS) GO TO 50                                          SHEAR 73
      DO 40 KK=1,IE                                                     SHEAR 74
      READ (27) XLNGTH,GKEIX,NPIX,NPKX,ITYPE,ASXLR,AILR,ZCRD,TSHEAR     SHEAR 75
      READ (3) SIBXXA                                                   SHEAR 76
      K=KK+IS                                                           SHEAR 77
      XLEN(K)=XLNGTH                                                    SHEAR 78
      DO 40 I=1,NLAY                                                    SHEAR 79
      A(I,K)=ASXLR(I)                                                   SHEAR 80
      SIG(I,K)=SIBXXA(I)                                                SHEAR 81
      TSHR(I,K)=TSHEAR(I)                                               SHEAR 82
      ZCR(I,K)=ZCRD(I)                                                  SHEAR 83
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      II=-1                                                          SHEAR 84
      IF (AILR(I).EQ.0.0) II=KC+1                                    SHEAR 85
      ITYP(I,K)=II                                                   SHEAR 86
   40 CONTINUE                                                       SHEAR 87
C                                                                    SHEAR 88
   50 CONTINUE                                                       SHEAR 89
C                                                                    SHEAR 90
      DO 60 I=1,NLAY                                                 SHEAR 91
      Q(I)=SIG(I,2)                                                  SHEAR 92
   60 CONTINUE                                                       SHEAR 93
C                                                                    SHEAR 94
      DO 160 II=1,NLAY                                               SHEAR 95
C                                                                    SHEAR 96
C     SHEAR IS COMPUTED AT CENTROID OF LAYER DEFINED BY ZCR MATRIX   SHEAR 97
C     SELECT CONCRETE LAYER  I FROM ELEMENT JJ                       SHEAR 98
C                                                                    SHEAR 99
      I=NLAY+1-II                                                    SHEAR100
      J=2                                                            SHEAR101
C                                                                    SHEAR102
C     DOT NOT COUNT EMBEDDED LAYERS OR PRESTRESS LAYERS (IE AILR = 0.0) SHEAR103
C                                                                    SHEAR104
      IF (ITYP(I,J).GT.KC) GO TO 150                                 SHEAR105
C                                                                    SHEAR106
      ZI=ZCR(I,J)                                                    SHEAR107
      ZIS=ZIE                                                        SHEAR108
      ZIE=ZI                                                         SHEAR109
      KSTEEL=0                                                       SHEAR110
      SA=0.                                                          SHEAR111
      SB=0.                                                          SHEAR112
      XM=XLEN(J)                                                     SHEAR113
C                                                                    SHEAR114
      DO 80 KK=1,NLAY                                                SHEAR115
      K=NLAY+1-KK                                                    SHEAR116
C                                                                    SHEAR117
C     SEARCH ELEMENT  OF INTEREST                                    SHEAR118
C     GET Z OF LAYER                                                 SHEAR119
C                                                                    SHEAR120
      ZLY=ZCR(K,J)                                                   SHEAR121
      AS=A(K,J)                                                      SHEAR122
C                                                                    SHEAR123
C     CHECK FOR EMBEDDED LAYER                                       SHEAR124
C                                                                    SHEAR125
      IF (ITYP(K,J).GT.KC) GO TO 70                                  SHEAR126
C                                                                    SHEAR127
C     FIND UPPER DIST OF LAYER                                       SHEAR128
C                                                                    SHEAR129
      T=AS/TSHR(K,J)                                                 SHEAR130
      ZU=ZLY+T/2.                                                    SHEAR131
      ZUE=ZLY-T/2.                                                   SHEAR132
C                                                                    SHEAR133
C     IS ZU TOO SMALL                                                SHEAR134
C                                                                    SHEAR135
      IF (ZU.LE.ZI) GO TO 80                                         SHEAR136
C                                                                    SHEAR137
C     FIND LOWER DIST OF LAYER                                       SHEAR138
C                                                                    SHEAR139
      ZL=ZLY-T/2.                                                    SHEAR140
C                                                                    SHEAR141
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C     DO WE CONSIDER A PORTION OF CONCRETE LAYER K OF ELEMENT J          SHEAR142
C                                                                        SHEAR143
      IF (ZL.LT.ZI) AS=(ZU-ZI)*TSHR(K,J)                                 SHEAR144
      SA=SA+SIG(K,J)*AS                                                  SHEAR145
      SB=SA                                                              SHEAR146
      GO TO 80                                                           SHEAR147
   70 CONTINUE                                                           SHEAR148
C                                                                        SHEAR149
C     EMBEDDED LAYER                                                     SHEAR150
C                                                                        SHEAR151
      IF (ZLY.LT.ZI) GO TO 80                                            SHEAR152
      KSTEEL=KSTEEL+1                                                    SHEAR153
      SA=SA+SIG(K,J)*AS                                                  SHEAR154
      SB=SA                                                              SHEAR155
   80 CONTINUE                                                           SHEAR156
C                                                                        SHEAR157
C     MOVE TO LEFT ELEMENT                                               SHEAR158
C                                                                        SHEAR159
      XL=0.                                                              SHEAR160
      SLB=0.                                                             SHEAR161
      IF (JJ.EQ.1) GO TO 110                                             SHEAR162
      J=1                                                                SHEAR163
      XL=XLEN(J)                                                         SHEAR164
      ISTEEL=0                                                           SHEAR165
C                                                                        SHEAR166
      DO 100 KK=1,NLAY                                                   SHEAR167
      K=NLAY+1-KK                                                        SHEAR168
      ZLY=ZGR(K,J)                                                       SHEAR169
      AS=A(K,J)                                                          SHEAR170
C                                                                        SHEAR171
C     CHECK FOR EMBEDDED LAYER                                           SHEAR172
C                                                                        SHEAR173
      IF (ITYP(K,J).GT.KC) GO TO 90                                      SHEAR174
C                                                                        SHEAR175
C     FIND UPPER DIST OF LAYER                                           SHEAR176
C                                                                        SHEAR177
      T=AS/TSHR(K,J)                                                     SHEAR178
      ZU=ZLY+T/2.                                                        SHEAR179
C                                                                        SHEAR180
C     IS ZU TOO SMALL                                                    SHEAR181
C                                                                        SHEAR182
      IF (ZU.LE.ZI) GO TO 100                                            SHEAR183
C                                                                        SHEAR184
C     FIND LOWER DIST OF LAYER                                           SHEAR185
C                                                                        SHEAR186
      ZL=ZLY-T/2.                                                        SHEAR187
C                                                                        SHEAR188
C     DO WE CONSIDER A PORTION OF CONCRETE LAYER K OF ELEMENT J          SHEAR189
C                                                                        SHEAR190
      IF (ZL.LT.ZI) AS=(ZU-ZI)*TSHR(K,J)                                 SHEAR191
      SLB=SLB+SIG(K,J)*AS                                                SHEAR192
      GO TO 100                                                          SHEAR193
   90 CONTINUE                                                           SHEAR194
C                                                                        SHEAR195
C     EMBEDDED LAYER                                                     SHEAR196
C                                                                        SHEAR197
      ISTEEL=ISTEEL+1                                                    SHEAR198
      IF (ISTEEL.GT.KSTEEL) GO TO 100                                    SHEAR199
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      SLB=SLB+SIG(K,J)*AS                                              SHEAR200
  100 CONTINUE                                                         SHEAR201
  110 CONTINUE                                                         SHEAR202
C                                                                      SHEAR203
C     MOVE TO THE RIGHT                                                SHEAR204
C                                                                      SHEAR205
      XR=0.                                                            SHEAR206
      SRA=0.                                                           SHEAR207
      IF (JJ.EQ.NBMS) GO TO 140                                        SHEAR208
      J=3                                                              SHEAR209
      XR=XLEN(J)                                                       SHEAR210
      ISTEEL=0                                                         SHEAR211
C                                                                      SHEAR212
      DO 130 KK=1,NLAY                                                 SHEAR213
      K=NLAY+1-KK                                                      SHEAR214
      ZLY=ZCR(K,J)                                                     SHEAR215
      AS=A(K,J)                                                        SHEAR216
C                                                                      SHEAR217
C     CHECK FOR EMBEDDED LAYER                                         SHEAR218
C                                                                      SHEAR219
      IF (ITYP(K,J).GT.KC) GO TO 120                                   SHEAR220
C                                                                      SHEAR221
C     FIND UPPER DIST OF LAYER                                         SHEAR222
C                                                                      SHEAR223
      T=AS/TSHR(K,J)                                                   SHEAR224
      ZU=ZLY+T/2.                                                      SHEAR225
C                                                                      SHEAR226
C     IS ZU TOO SMALL                                                  SHEAR227
C                                                                      SHEAR228
      IF (ZU.LE.ZI) GO TO 130                                          SHEAR229
C                                                                      SHEAR230
C     FIND LOWER DIST OF LAYER                                         SHEAR231
C                                                                      SHEAR232
      ZL=ZLY-T/2.                                                      SHEAR233
C                                                                      SHEAR234
C     DO WE CONSIDER A PORTION OF CONCRETE LAYER K OF ELEMENT J        SHEAR235
C                                                                      SHEAR236
      IF (ZL.LT.ZI) AS=(ZU-ZI)*TSHR(K,J)                               SHEAR237
      SRA=SRA+SIG(K,J)*AS                                              SHEAR238
      GO TO 130                                                        SHEAR239
  120 CONTINUE                                                         SHEAR240
C                                                                      SHEAR241
C     EMBEDDED LAYER                                                   SHEAR242
C                                                                      SHEAR243
      ISTEEL=ISTEEL+1                                                  SHEAR244
      IF (ISTEEL.GT.KSTEEL) GO TO 130                                  SHEAR245
      SRA=SRA+SIG(K,J)*AS                                              SHEAR246
  130 CONTINUE                                                         SHEAR247
  140 CONTINUE                                                         SHEAR248
C                                                                      SHEAR249
C     CHEK IF ENDS OF BEAM                                             SHEAR250
C                                                                      SHEAR251
      ENDF=1.                                                          SHEAR252
      IF(JJ.EQ.1 .OR. JJ.EQ.NBMS) ENDF = 2.                            SHEAR253
      IF (JJ.EQ.1) SA=0.                                               SHEAR254
      IF (JJ.EQ.NBMS) SB=0.                                            SHEAR255
C                                                                      SHEAR256
C     COMPUTE LAYER SHEAR                                              SHEAR257
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C                                                                       SHEAR258
      AS=(SLB-SA)/(XL+XM)+(SB-SRA)/(XM+XR)                              SHEAR259
      AS=AS*ENDF                                                        SHEAR260
      QQ(I)=AS/TSHR(I,2)                                                SHEAR261
      QS=QE                                                             SHEAR262
      QE=QQ(I)                                                          SHEAR263
      GO TO 160                                                         SHEAR264
  150 CONTINUE                                                          SHEAR265
      QQ(I)=0.0                                                         SHEAR266
  160 CONTINUE                                                          SHEAR267
C                                                                       SHEAR268
      SA=0.                                                             SHEAR269
      WRITE (4) Q,(SA,K=1,NLAY),QQ                                      SHEAR270
      IF (RDFPR.NE.3HYES) GO TO 190                                     SHEAR271
C                                                                       SHEAR272
C     COMPUTE INTERFACE SHEAR BETWEEN BEAM AND SLAB                     SHEAR273
C                                                                       SHEAR274
      QE=(ZUE-ZIS)*(QE-QS)/(ZIE-ZIS)+QS                                 SHEAR275
      KK=JJ+NBMS*(JOE-1)                                                SHEAR276
      IF (ABS(QE).LT.SHEARM) GO TO 170                                  SHEAR277
      NVAL(2)=3HYES                                                     SHEAR278
      IVAL(2)=KK                                                        SHEAR279
      IVAL(3)=0                                                         SHEAR280
  170 CONTINUE                                                          SHEAR281
      WRITE (IO,180) KK,QE                                              SHEAR282
  180 FORMAT (1H ,14X,I3,9X,F9.4)                                       SHEAR283
C                                                                       SHEAR284
  190 CONTINUE                                                          SHEAR285
C                                                                       SHEAR286
      IF (RDFPR.NE.3HYES) GO TO 210                                     SHEAR287
      WRITE (IO,200)                                                    SHEAR288
  200 FORMAT (//,6X,4HN ML,9X,5HSXX  ,9X,5HSZZ  ,9X,5HSXZ  ,10X,2HS1,13XSHEAR289
     1,2HS2,10X,6HTHETA1)                                               SHEAR290
      CALL PRISTR (Q,SIBXXA,QQ,1.0,4,NLAY,NBEAMX,NLAY,0,SPHI,IO)        SHEAR291
  210 CONTINUE                                                          SHEAR292
      RETURN                                                            SHEAR293
      END                                                               SHEAR294
      OVERLAY  (ECCP,1,0)                                               OVERL1 2
      PROGRAM OVERL1                                                    OVERL1 3
C                                                                       OVERL1 4
C     THIS OVERLAY SETS UP SLAB DATA/TAPES AND COMPUTES FORCE VECTORS   OVERL1 5
C                                                                       OVERL1 6
      COMMON /CB01/ NUMEL,NANA,NUMNP,NETA,NA1,NULAY,NSLAYR,NCNS         OVERL1 7
      COMMON /CB4/ IN,IO                                                OVERL1 8
      COMMON /CBS301/ COUPLE                                            OVERL1 9
      COMMON /CB310/ NELX,NSMAT,NELY                                    OVERL110
      COMMON /CB300/ NPERBM,NREADB,KSIG,KIN,KC,KMAT,KPS,NOBM,NNN        OVERL111
      COMMON /CB2/ NBEAMX,NIX(6)                                        OVERL112
      COMMON /PBEAM/ NPBEAM(20)                                         OVERL113
      COMMON /TUOO/ TUO(8,12)                                           OVERL114
      COMMON /PDIM/ PDT(70)                                             OVERL115
      COMMON /DEADL/ IDEAD,ITERD,NITERD,ITRALD                          OVERL116
      COMMON /SKEW/ PHI,AU(2,2),AO(3,3),DS(3,3)                         OVERL117
      COMMON /ICORES/ ICORE                                             OVERL118
      COMMON /STCHK/ STRAMS(30)                                         OVERL119
      COMMON /CRWS/ CRS(10)                                             OVERL120
      COMMON /PREDN/ PRED,IDX,IDY                                       OVERL121
      COMMON /SIGNIF/ NSIGNI(2)                                         OVERL122
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      COMMON /OVER1/ N1,N2,N3,N4,N5,N6,N7,N8,N9,N10,N11,N12,N13,N14,N15,OVERL123
     1N16,N17                                                          OVERL124
      COMMON A(1)                                                      OVERL125
C                                                                      OVERL126
C                                                                      OVERL127
      IF (ICORE.NE.0) GO TO 10                                         OVERL128
      ICORE=LOCF(A(1))+1                                               OVERL129
      GO TO 20                                                         OVERL130
   10 CONTINUE                                                         OVERL131
      CALL PINF (NANA,NUMEL,NUMNP,NA1,NULAY,NSLAYR,NELX,NELY,NSMAT,A(N1)OVERL132
     1,A(N2),A(N3),A(N4),A(N5),A(N6),A(N7),A(N8),A(N9),A(N10),A(N11),A(NOVERL133
     212),A(N13),A(N14),A(N15),A(N16))                                 OVERL134
   20 CONTINUE                                                         OVERL135
      END                                                              OVERL136
      SUBROUTINE PINF (NANA,NUMEL,NUMNP,NA1,NULAY,NSLAYR,NELX,NELY,NSMATPINF   2
     1,NPI,NPJ,NPK,NPL,ELLA,ELLB,NEQ1,NEQ2,NEQ3,NEQ4,DT,Q,FORCE,LILA,XSEPINF   3
     2G,YSEG)                                                          PINF   4
C                                                                      PINF   5
C     THIS SUBROUTINE READS AND COMPUTES DATA FOR SLAB                 PINF   6
C                                                                      PINF   7
      COMMON /PDIM/ PDT(15),PZC(15),SEMOD(4),SIGMAP(4),SPRON(4),SPROM(4)PINF   8
     1,NSTYPE(6),SDT(6),SZC(6),SPHI(6)                                 PINF   9
      COMMON /TUOO/ TUO(8,12)                                          PINF  10
      COMMON /STCHK/ STRAMS(6),STTEMS(6),STCEMS(6),NKS(6),NHS(6)       PINF  11
      COMMON /CRWS/ ACR(2),CMIN(2),WCMAX(2),W(4)                       PINF  12
      COMMON /PREDN/ PRED,IDX,IDY                                      PINF  13
      COMMON /SIGNIF/ NSIGNI(2)                                        PINF  14
      COMMON /PROPC/ V,EC,FC,ECOMP,FT,ET,PCOMP,ALMM,SALMM,EALMM,ALICC  PINF  15
      COMMON /PROPCB/ ZA,EZA,ZB,EZB                                    PINF  16
      COMMON /EDOWN/ EDOWNC,EDOWNT                                     PINF  17
      COMMON /CBS301/ COUPLE                                           PINF  18
      COMMON /C84/ IN,IO                                               PINF  19
      COMMON /CB300/ NPERBM,NREADB,KSIG,KIN,KC,KMAT,KPS,NOBM,NNN       PINF  20
      COMMON /CB2/ NBEAMX,NIX(6)                                       PINF  21
      COMMON /PBEAM/ NPBEAM(20)                                        PINF  22
      COMMON /DEADL/ IDEAD,ITERD,NITERD,ITRALD                         PINF  23
      DIMENSION NPI(NANA), NPJ(NANA), NPK(NANA), NPL(NANA), ELLA(NUMEL),PINF  24
     1 ELLB(NUMEL), DT(NUMEL), Q(NUMEL), NEQ1(NUMNP), NEQ2(NUMNP), NEQ3(PINF  25
     2NUMNP), NEQ4(NUMNP), FORCE(NA1), LILA(NA1), XSEG(NELX), YSEG(NELY)PINF  26
     3, NZ(4)                                                          PINF  27
C                                                                      PINF  28
      DIMENSION TIN(10)                                                PINF  29
      DIMENSION FTFIND(18)                                             PINF  30
      DIMENSION BARSZ(11)                                              PINF  31
      DATA (FTFIND(I),I=1,18)/0.,1.,2.,3.,4.,5.,6.,7.,1000.,.11,.11,.1,.PINF  32
     109,.09,.08,.08,.07,.07/                                          PINF  33
      DATA (BARSZ(I),I=1,11)/0.,.05,.11,.2,.31,.44,.6,.79,1.,1.27,1.56/ PINF  34
C                                                                      PINF  35
C     COUPLING BETWEEN THE INPLANE AND BENDING BEHAVIOR IS CONSIDERED  PINF  36
C                                                                      PINF  37
      COUPLE=3HYES                                                     PINF  38
C                                                                      PINF  39
C     INITIALIZE                                                       PINF  40
C                                                                      PINF  41
      DO 10 I=1,20                                                     PINF  42
   10 NPBEAM(I)=0                                                      PINF  43
C                                                                      PINF  44
      DO 20 I=1,8                                                      PINF  45
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      DO 20 J=1,12                                                      PINF  46
   20 TUO(I,J)=0.                                                       PINF  47
      TUO(1,3)=1.0                                                      PINF  48
      TUO(3,6)=1.0                                                      PINF  49
      TUO(5,9)=1.0                                                      PINF  50
      TUO(7,12)=1.0                                                     PINF  51
      TUO(2,2)=-1.0                                                     PINF  52
      TUO(4,5)=-1.0                                                     PINF  53
      TUO(6,8)=-1.0                                                     PINF  54
      TUO(8,11)=-1.0                                                    PINF  55
      WRITE (IO,30)                                                     PINF  56
   30 FORMAT (1H1,////)                                                 PINF  57
C                                                                       PINF  58
C     CHECK FOR PREDISCRETIZATION                                       PINF  59
C                                                                       PINF  60
      IF (PRED.NE.3HYES) GO TO 140                                      PINF  61
C                                                                       PINF  62
C     FOR PREDISCRETIZATION                                             PINF  63
C                                                                       PINF  64
      READ (IN,150) A                                                   PINF  65
      READ (IN,150) B                                                   PINF  66
C                                                                       PINF  67
      WRITE (IO,40) A,B                                                 PINF  68
   40 FORMAT (1H0,//,6X,*LENGTH = *,F8.2,* (IN)    WIDTH = *,F8.2,* (IN)*PINF  69
     1)                                                                 PINF  70
C                                                                       PINF  71
C     CHECK TRANSVERSE MESH GENERATION CODE                             PINF  72
C                                                                       PINF  73
      IF (IDY.EQ.-100) GO TO 90                                         PINF  74
      IF (IDY.EQ.-200) GO TO 100                                        PINF  75
C                                                                       PINF  76
      N=1                                                               PINF  77
      K=0                                                               PINF  78
      J=NOBM-1                                                          PINF  79
      C=J                                                               PINF  80
      IF (IDY.GT.0) C=C+.5                                              PINF  81
      RIDY=IABS(IDY)                                                    PINF  82
      NS=IABS(IDY)                                                      PINF  83
      IF (J.EQ.0) GO TO 70                                              PINF  84
C                                                                       PINF  85
      DO 60 M=1,J                                                       PINF  86
C                                                                       PINF  87
C     SET STARTING NODE FOR BEAMS                                       PINF  88
C                                                                       PINF  89
      NPBEAM(M)=(N-1)*(NELX+1)+1                                        PINF  90
C                                                                       PINF  91
      DO 50 L=1,NS                                                      PINF  92
C                                                                       PINF  93
C     SET ELEMENT DIMENSIONS IN TRANSVERSE DIRECTION                    PINF  94
C                                                                       PINF  95
      K=K+1                                                             PINF  96
      YSEG(K)=B/C/RIDY                                                  PINF  97
   50 CONTINUE                                                          PINF  98
C                                                                       PINF  99
      N=N+NS                                                            PINF 100
   60 CONTINUE                                                          PINF 101
C                                                                       PINF 102
   70 CONTINUE                                                          PINF 103
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C                                                                       PINF 104
C     SET LAST BEAM                                                     PINF 105
C                                                                       PINF 106
      NPBEAM(M)=(N-1)*(NELX+1)+1                                        PINF 107
      IF (IDY.LT.0) GO TO 110                                           PINF 108
C                                                                       PINF 109
C     SET    IDY ADDITIONAL ROWS OF ELEMENTS                            PINF 110
C                                                                       PINF 111
      DO 80 L=1,NS                                                      PINF 112
      K=K+1                                                             PINF 113
      YSEG(K)=B/C/RIDY/2.                                               PINF 114
   80 CONTINUE                                                          PINF 115
      GO TO 110                                                         PINF 116
   90 CONTINUE                                                          PINF 117
C                                                                       PINF 118
C     IDY = -100                                                        PINF 119
C                                                                       PINF 120
      YSEG(1)=0.3*B                                                     PINF 121
      YSEG(2)=0.3*B                                                     PINF 122
      YSEG(3)=0.20*B                                                    PINF 123
      YSEG(4)=0.10*B                                                    PINF 124
      YSEG(5)=0.05*B                                                    PINF 125
      YSEG(6)=0.05*B                                                    PINF 126
      GO TO 110                                                         PINF 127
C                                                                       PINF 128
  100 CONTINUE                                                          PINF 129
C                                                                       PINF 130
C     IDY = -200                                                        PINF 131
C                                                                       PINF 132
      YSEG(1)=0.2*B                                                     PINF 133
      YSEG(2)=0.15*B                                                    PINF 134
      YSEG(3)=0.10*B                                                    PINF 135
      YSEG(4)=0.05*B                                                    PINF 136
      YSEG(5)=0.05*B                                                    PINF 137
      YSEG(6)=0.10*B                                                    PINF 138
      YSEG(7)=0.15*B                                                    PINF 139
      YSEG(8)=0.20*B                                                    PINF 140
  110 CONTINUE                                                          PINF 141
C                                                                       PINF 142
C     SET ELEMENT DIMENSIONS IN LONGITUDINAL DIRECTION                  PINF 143
C                                                                       PINF 144
      IF (IDX.EQ.-1) GO TO 120                                          PINF 145
      IF (IDX.EQ.-2) GO TO 130                                          PINF 146
C                                                                       PINF 147
C     IDX = -3                                                          PINF 148
C                                                                       PINF 149
      XSEG(1)=0.3*A                                                     PINF 150
      XSEG(2)=0.3*A                                                     PINF 151
      XSEG(3)=0.2*A                                                     PINF 152
      XSEG(4)=0.1*A                                                     PINF 153
      XSEG(5)=0.05*A                                                    PINF 154
      XSEG(6)=0.05*A                                                    PINF 155
      GO TO 160                                                         PINF 156
C                                                                       PINF 157
  120 CONTINUE                                                          PINF 158
C                                                                       PINF 159
C     IDX = -1                                                          PINF 160
C                                                                       PINF 161
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      XSEG(1)=0.1*A                                                    PINF 162
      XSEG(2)=0.1*A                                                    PINF 163
      XSEG(3)=0.05*A                                                   PINF 164
      XSEG(4)=0.05*A                                                   PINF 165
      XSEG(5)=0.1*A                                                    PINF 166
      XSEG(6)=0.1*A                                                    PINF 167
      XSEG(7)=0.2*A                                                    PINF 168
      XSEG(8)=0.3*A                                                    PINF 169
      GO TO 160                                                        PINF 170
C                                                                      PINF 171
  130 CONTINUE                                                         PINF 172
C                                                                      PINF 173
C     IDX = -2                                                         PINF 174
C                                                                      PINF 175
      XSEG(1)=0.2*A                                                    PINF 176
      XSEG(2)=0.15*A                                                   PINF 177
      XSEG(3)=0.1*A                                                    PINF 178
      XSEG(4)=0.05*A                                                   PINF 179
      XSEG(5)=0.05*A                                                   PINF 180
      XSEG(6)=0.1*A                                                    PINF 181
      XSEG(7)=0.15*A                                                   PINF 182
      XSEG(8)=0.2*A                                                    PINF 183
      GO TO 160                                                        PINF 184
C                                                                      PINF 185
C                                                                      PINF 186
  140 CONTINUE                                                         PINF 187
C                                                                      PINF 188
C     READ IN THE ELEMENT DIMENSIONS                                   PINF 189
      READ (IN,150) (XSEG(N),N=1,NELX)                                 PINF 190
      READ (IN,150) (YSEG(N),N=1,NELY)                                 PINF 191
  150 FORMAT (8F10.0)                                                  PINF 192
C                                                                      PINF 193
C                                                                      PINF 194
  160 CONTINUE                                                         PINF 195
C                                                                      PINF 196
      WRITE (IO,170) (XSEG(N),N=1,NELX)                                PINF 197
  170 FORMAT (/,1H0,5X,*ELEMENT LENGTHS IN THE X DIRECTION ARE*,* (IN)*,PINF 198
     1(/5X,8(3X,F10.4)))                                               PINF 199
      WRITE (IO,180) (YSEG(N),N=1,NELY)                                PINF 200
  180 FORMAT (/,1H0,5X,*ELEMENT LENGTHS IN THE Y DIRECTION ARE*,* (IN)*,PINF 201
     1(/5X,8(3X,F10.4)))                                               PINF 202
C                                                                      PINF 203
C     SET UP ELEMENT TOPOLOGY                                          PINF 204
C                                                                      PINF 205
      DO 190 I=1,NUMNP                                                 PINF 206
      NEQ1(I)=NUMEL+1                                                  PINF 207
      NEQ2(I)=NUMEL+1                                                  PINF 208
      NEQ3(I)=NUMEL+1                                                  PINF 209
      NEQ4(I)=NUMEL+1                                                  PINF 210
  190 CONTINUE                                                         PINF 211
      DO 200 J=1,NELY                                                  PINF 212
      DO 200 I=1,NELX                                                  PINF 213
      M=I+(J-1)*NELX                                                   PINF 214
      ELLA(M)=XSEG(I)/2.0                                              PINF 215
      ELLB(M)=YSEG(J)/2.0                                              PINF 216
      NPI(M)=I+(J-1)*(NELX+1)                                          PINF 217
      NPK(M)=NPI(M)+1                                                  PINF 218
      NPJ(M)=NPI(M)+NELX+1                                             PINF 219
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      NPL(M)=NPI(M)+NELX+2                                              PINF 220
      NEQ1(NPI(M))=M                                                    PINF 221
      NEQ2(NPK(M))=M                                                    PINF 222
      NEQ3(NPL(M))=M                                                    PINF 223
      NEQ4(NPJ(M))=M                                                    PINF 224
  200 CONTINUE                                                          PINF 225
      J=NUMNP+1                                                         PINF 226
      I=NUMEL+1                                                         PINF 227
      NPI(I)=J                                                          PINF 228
      NPJ(I)=J                                                          PINF 229
      NPK(I)=J                                                          PINF 230
      NPL(I)=J                                                          PINF 231
C                                                                       PINF 232
C                                                                       PINF 233
      DO 210 I=1,NA1                                                    PINF 234
  210 LILA(I)=0                                                         PINF 235
C                                                                       PINF 236
C     READ ELEMENT THICKNESS                                            PINF 237
C                                                                       PINF 238
      WRITE (IO,220)                                                    PINF 239
  220 FORMAT (1H )                                                      PINF 240
  230 READ (IN,240) NS,VALUE,NE,INC                                     PINF 241
  240 FORMAT (I5,F10.0,I5,I5)                                           PINF 242
C                                                                       PINF 243
      IF (NE.EQ.0) NE=NS                                                PINF 244
      IF (INC.EQ.0) INC=1                                               PINF 245
      IF (NS.NE.0) GO TO 250                                            PINF 246
      NS=1                                                              PINF 247
      NE=NUMEL                                                          PINF 248
  250 CONTINUE                                                          PINF 249
      WRITE (IO,260) NS,VALUE,NE,INC                                    PINF 250
  260 FORMAT (1H0,5X,*ELEMENT *,I3,* THICKNESS = *,F8.3,*(IN)*,* END ELEPINF 251
     1MENT IS *,I3,*  INCREMENT IS *,I3)                                PINF 252
C                                                                       PINF 253
      IF (NE.GT.NUMEL) STOP 1                                           PINF 254
      IF (NS.GT.NUMEL.OR.NS.LE.0) STOP 1                                PINF 255
C                                                                       PINF 256
      DO 270 I=NS,NE,INC                                                PINF 257
  270 DT(I)=VALUE                                                       PINF 258
      IF (NE.LT.NUMEL) GO TO 230                                        PINF 259
C                                                                       PINF 260
C                                                                       PINF 261
      REWIND 28                                                         PINF 262
      DO 280 I=1,NUMEL                                                  PINF 263
      WRITE (28) DT(I),ELLA(I),ELLB(I),NPI(I),NPJ(I),NPK(I),NPL(I)      PINF 264
  280 CONTINUE                                                          PINF 265
      WRITE (28) XSEG,YSEG                                              PINF 266
C                                                                       PINF 267
      REWIND 12                                                         PINF 268
      REWIND 11                                                         PINF 269
      DO 300 M=1,NUMNP                                                  PINF 270
      N1=NEQ1(M)                                                        PINF 271
      NZ(1) = NEQ1(M)                                                   PINF 272
      N2=NEQ2(M)                                                        PINF 273
      NZ(2) = NEQ2(M)                                                   PINF 274
      N3=NEQ3(M)                                                        PINF 275
      NZ(3) = NEQ3(M)                                                   PINF 276
      N4=NEQ4(M)                                                        PINF 277
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      NZ(4) = NEQ4(M)                                                   PINF 278
      WRITE (11) N1,N2,N3,N4,NPJ(N1),NPK(N1),NPL(N1),NPI(N2),NPJ(N2),NPLPINF 279
     1(N2),NPI(N3),NPJ(N3),NPK(N3),NPI(N4),NPK(N4),NPL(N4)              PINF 280
      DO 290 NR=1,4                                                     PINF 281
      N=NZ(NR)                                                          PINF 282
      IF (N.EQ.NANA) GO TO 290                                          PINF 283
      A=ELLA(N)                                                         PINF 284
      B=ELLB(N)                                                         PINF 285
      C=DT(N)                                                           PINF 286
      WRITE (12) C,A,B                                                  PINF 287
  290 CONTINUE                                                          PINF 288
  300 CONTINUE                                                          PINF 289
C                                                                       PINF 290
C     SET UP COUNTER USED IN DEAD LOAD FORCE VECTOR INPUT               PINF 291
C                                                                       PINF 292
      IDD=0                                                             PINF 293
  310 IDD=IDD+1                                                         PINF 294
C                                                                       PINF 295
      WRITE (IO,220)                                                    PINF 296
C                                                                       PINF 297
      DO 320 I=1,NA1                                                    PINF 298
  320 FORCE(I)=0.                                                       PINF 299
C                                                                       PINF 300
      DO 330 I=1,NUMEL                                                  PINF 301
  330 Q(I)=0.0                                                          PINF 302
C                                                                       PINF 303
  340 CONTINUE                                                          PINF 304
      WRITE (IO,220)                                                    PINF 305
C                                                                       PINF 306
C     THIS ROUTINE IS USED TO READ LIVE LOAD FORCE VECTOR,              PINF 307
C          BOUNDARY CONDITIONS, AND DEAD LOAD FORCE VECTOR              PINF 308
C                                                                       PINF 309
      READ (IN,350) (TIN(I),I=1,10),NC                                  PINF 310
  350 FORMAT (10A1,I5)                                                  PINF 311
      WRITE (IO,360) (TIN(I),I=1,10),NC                                 PINF 312
  360 FORMAT (1H0,5X,*TITLE = *,10A1,*  NUMBER OF CARDS = *,I3)         PINF 313
C                                                                       PINF 314
      ILOC=5                                                            PINF 315
      DO 370 N=1,10                                                     PINF 316
      IF (TIN(N).EQ.1HE) GO TO 560                                      PINF 317
      IF (TIN(N).EQ.1HU) ILOC=4                                         PINF 318
      IF (TIN(N).EQ.1HV) ILOC=3                                         PINF 319
      IF (TIN(N).EQ.1HW) ILOC=2                                         PINF 320
      IF (TIN(N).EQ.1HX) ILOC=1                                         PINF 321
      IF (TIN(N).EQ.1HY) ILOC=0                                         PINF 322
      IF (TIN(N).EQ.1HQ) ILOC=-1                                        PINF 323
      IF (TIN(N).EQ.1HA) ILOC=-3                                        PINF 324
      IF (TIN(N).EQ.1HL) ILOC=-2                                        PINF 325
      IF (TIN(N).EQ.1HT) ILOC=-4                                        PINF 326
      I=N                                                               PINF 327
      IF (ILOC.LT.5) GO TO 390                                          PINF 328
  370 CONTINUE                                                          PINF 329
C                                                                       PINF 330
      WRITE (IO,380)                                                    PINF 331
  380 FORMAT (1H0,5X,*NO TRANSLATION*,//)                               PINF 332
      STOP                                                              PINF 333
C                                                                       PINF 334
  390 CONTINUE                                                          PINF 335
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      IF (ILOC.LT.0) GO TO 410                                          PINF 336
      M=0                                                               PINF 337
      DO 400 N=I,10                                                     PINF 338
      IF (TIN(N).EQ.1HD) M=1                                            PINF 339
      IF (TIN(N).EQ.1HF) M=2                                            PINF 340
      IF (M.GT.0) GO TO 490                                             PINF 341
  400 CONTINUE                                                          PINF 342
C                                                                       PINF 343
      WRITE (IO,380)                                                    PINF 344
      STOP                                                              PINF 345
C                                                                       PINF 346
C                                                                       PINF 347
  410 CONTINUE                                                          PINF 348
      IF (ILOC.EQ.-3) GO TO 450                                         PINF 349
      IF (ILOC.EQ.-4) GO TO 430                                         PINF 350
C                                                                       PINF 351
C     LONGITUDINAL LINE OF SYMMETRY                                     PINF 352
C                                                                       PINF 353
      M=NELX+1                                                          PINF 354
      N=NELY*M                                                          PINF 355
      DO 420 J=1,M                                                      PINF 356
      I=J+N                                                             PINF 357
      LILA(I*5-3)=1                                                     PINF 358
      LILA(I*5-1)=1                                                     PINF 359
  420 CONTINUE                                                          PINF 360
      IF (ILOC.EQ.-2) GO TO 450                                         PINF 361
  430 CONTINUE                                                          PINF 362
C                                                                       PINF 363
C     TRANSVERSE LINE OF SYMMETRY                                       PINF 364
C                                                                       PINF 365
      N=NELX+1                                                          PINF 366
      M=NELY+1                                                          PINF 367
      DO 440 J=1,M                                                      PINF 368
      I=J*N                                                             PINF 369
      LILA(I*5-4)=1                                                     PINF 370
      LILA(I*5)=1                                                       PINF 371
  440 CONTINUE                                                          PINF 372
      GO TO 470                                                         PINF 373
  450 CONTINUE                                                          PINF 374
C                                                                       PINF 375
C     SIMPLE SUPPORTS AT NODES OF FAR END                               PINF 376
C                                                                       PINF 377
      N=NELX+1                                                          PINF 378
      M=NELY+1                                                          PINF 379
      DO 460 J=1,M                                                      PINF 380
      I=J*N                                                             PINF 381
      LILA(I*5-4)=1                                                     PINF 382
      LILA(I*5-2)=1                                                     PINF 383
      LILA(I*5-1)=1                                                     PINF 384
  460 CONTINUE                                                          PINF 385
  470 CONTINUE                                                          PINF 386
C                                                                       PINF 387
C     SIMPLE SUPPORTS AT NODES OF NEAR END                              PINF 388
C                                                                       PINF 389
      N=NELX+1                                                          PINF 390
      M=NELY+1                                                          PINF 391
      DO 480 J=1,M                                                      PINF 392
      I=NELX*(J-1)+J                                                    PINF 393
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      LILA(I*5-2)=1                                                    PINF 394
      LILA(I*5-1)=1                                                    PINF 395
  480 CONTINUE                                                         PINF 396
      I=1+NELY*(NELX+1)                                                PINF 397
      LILA(I*5-3)=1                                                    PINF 398
      GO TO 340                                                        PINF 399
C                                                                      PINF 400
  490 CONTINUE                                                         PINF 401
      IF (M.EQ.2) GO TO 530                                            PINF 402
C                                                                      PINF 403
C     READ IN DISPLACEMENT BOUNDARY CONDITIONS                         PINF 404
C     1 = FIXED, 0= FREE                                               PINF 405
C                                                                      PINF 406
      IF (NC.EQ.0) GO TO 340                                           PINF 407
      DO 520 N=1,NC                                                    PINF 408
      IF (NC.EQ.0) GO TO 340                                           PINF 409
      READ (IN,500) NS,IVALUE,NE,INC                                   PINF 410
  500 FORMAT (4I5)                                                     PINF 411
C                                                                      PINF 412
      IF (NE.EQ.0) NE=NS                                               PINF 413
      IF (INC.EQ.0) INC=1                                              PINF 414
C                                                                      PINF 415
      WRITE (IO,510) NS,IVALUE,NE,INC                                  PINF 416
  510 FORMAT (1H0,5X,*NODE = *,I3,*  VALUE = *,I3,*  END NODE = *,I3,* PINF 417
     1 INCREMENTED BY*,I3)                                             PINF 418
C                                                                      PINF 419
      IF (NS.GT.NUMNP.OR.NS.LE.0) STOP 1                               PINF 420
      IF (NE.GT.NUMNP) STOP 1                                          PINF 421
C                                                                      PINF 422
C                                                                      PINF 423
      DO 520 I=NS,NE,INC                                               PINF 424
  520 LILA(5*I-ILOC)=IVALUE                                            PINF 425
C                                                                      PINF 426
      GO TO 340                                                        PINF 427
C                                                                      PINF 428
C     READ IN NODAL POINT FORCES                                       PINF 429
C     FORCES ARE IN KIPS AND IN-KIPS                                   PINF 430
C                                                                      PINF 431
  530 CONTINUE                                                         PINF 432
      IF (NC.EQ.0) GO TO 340                                           PINF 433
      DO 550 N=1,NC                                                    PINF 434
      READ (IN,240) NS,VALUE,NE,INC                                    PINF 435
C                                                                      PINF 436
      IF (NE.EQ.0) NE=NS                                               PINF 437
      IF (INC.EQ.0) INC=1                                              PINF 438
C                                                                      PINF 439
      WRITE (IO,540) NS,VALUE,NE,INC                                   PINF 440
  540 FORMAT (1H0,5X,*NODE = *,I3,*  VALUE = *,F9.3,*  END NODE = *,I3,*PINF 441
     1  INCREMENTED BY *,I3)                                           PINF 442
C                                                                      PINF 443
      IF (NE.GT.NUMNP) STOP 1                                          PINF 444
      IF (NS.GT.NUMNP.OR.NS.LE.0) STOP 1                               PINF 445
C                                                                      PINF 446
C                                                                      PINF 447
      DO 550 I=NS,NE,INC                                               PINF 448
  550 FORCE(I*5-ILOC)=VALUE                                            PINF 449
C                                                                      PINF 450
      GO TO 340                                                        PINF 451
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C                                                                       PINF 452
  560 CONTINUE                                                          PINF 453
C                                                                       PINF 454
C     READ UNIFORM LINE LOAD (KIPS/IN)                                  PINF 455
C                                                                       PINF 456
      WRITE (IO,220)                                                    PINF 457
      WRITE (IO,570)                                                    PINF 458
  570 FORMAT (1H0,5X,*UNIFORM LINE LOADS (KIPS/IN) ALONG X-DIRECTION NODPINF 459
     1AL LINES*)                                                        PINF 460
      READ (IN,240) NC                                                  PINF 461
      WRITE (IO,580) NC                                                 PINF 462
  580 FORMAT (1H0,5X,*NUMBER OF UNIFORM LINE LOAD CARDS =*,I5)          PINF 463
C                                                                       PINF 464
      IF (NC.EQ.0) GO TO 610                                            PINF 465
      DO 600 K=1,NC                                                     PINF 466
C                                                                       PINF 467
      READ (IN,240) NB,A                                                PINF 468
      WRITE (IO,590) NB,A                                               PINF 469
  590 FORMAT (1H0,5X,*STARTING NODE POINT IS *,I3,*  LOAD = *,F9.4)      PINF 470
      IF (NB.GT.NUMNP) STOP 1                                           PINF 471
C                                                                       PINF 472
C     ADD TO FORCE VECTOR                                               PINF 473
C                                                                       PINF 474
      DO 600 M=1,NELX                                                   PINF 475
      I=NB+M-1                                                          PINF 476
      J=I+1                                                             PINF 477
      B=XSEG(M)                                                         PINF 478
      C=A*B/2.0                                                         PINF 479
      FORCE(5*I-2)=FORCE(5*I-2)+C                                       PINF 480
      FORCE(5*J-2)=FORCE(5*J-2)+C                                       PINF 481
      C=A*B*B/12.0                                                      PINF 482
      FORCE(5*I)=FORCE(5*I)-C                                           PINF 483
      FORCE(5*J)=FORCE(5*J)+C                                           PINF 484
  600 CONTINUE                                                          PINF 485
  610 CONTINUE                                                          PINF 486
C                                                                       PINF 487
C     READ IN THE DISTRIBUTED FORCES                                    PINF 488
C                                                                       PINF 489
      WRITE (IO,220)                                                    PINF 490
      READ (IN,240) NC                                                  PINF 491
      WRITE (IO,620) NC                                                 PINF 492
  620 FORMAT (1H0,5X,*DISTRIBUTED FORCES (KIPS/SQ.IN)  *,/,6X,*NUMBER OFPINF 493
     1 LOAD CARDS*,14X,*=*,I5)                                          PINF 494
      IF (NC.EQ.0) GO TO 650                                            PINF 495
C                                                                       PINF 496
      DO 640 M=1,NC                                                     PINF 497
      READ (IN,240) NS,A,NE,INC                                         PINF 498
C                                                                       PINF 499
      IF (NS.EQ.0) NE=NUMEL                                             PINF 500
      IF (NS.EQ.0) NS=1                                                 PINF 501
      IF (NE.EQ.0) NE=NS                                                PINF 502
      IF (INC.EQ.0) INC=1                                               PINF 503
C                                                                       PINF 504
      WRITE (IO,630) NS,A,NE,INC                                        PINF 505
  630 FORMAT (1H0,5X,*ELEMENT = *,I3,*  LOAD = *,F9.4,* END ELEMENT = *,PINF 506
     1I3,*  INCREMENTED BY *,I3)                                        PINF 507
C                                                                       PINF 508
      IF (NE.GT.NUMEL) STOP 1                                           PINF 509
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      IF (NS.GT.NUMEL.OR.NS.LE.0) STOP 1                                PINF 510
C                                                                       PINF 511
C                                                                       PINF 512
      DO 640 I=NS,NE,INC                                                PINF 513
  640 Q(I)=A                                                            PINF 514
C                                                                       PINF 515
  650 CONTINUE                                                          PINF 516
C                                                                       PINF 517
C     ADD DISTRIBUTED LOADS TO FORCE VECTOR                             PINF 518
C                                                                       PINF 519
      CALL GELOAD (Q,NANA,NUMNP,NA1,NUMEL,NPI,NPJ,NPK,NPL,NEQ1,NEQ2,NEQ3PINF 520
     1,NEQ4,ELLA,ELLB,FORCE)                                            PINF 521
C                                                                       PINF 522
C     READ CONCENTRATED LOADS LOCATED WITHIN ELEMENTS                   PINF 523
C     COMPUTE NODAL POINT FORCES AND ADD TO FORCE VECTOR                PINF 524
C                                                                       PINF 525
C                                                                       PINF 526
      CALL COLOAD (NELX,NELY,NA1,NANA,IN,IO,XSEG,YSEG,FORCE,NPI,NPJ,NPK,PINF 527
     1NPL)                                                              PINF 528
C                                                                       PINF 529
C     PRINT FORCE VECTOR                                                PINF 530
C                                                                       PINF 531
      WRITE (IO,660)                                                    PINF 532
  660 FORMAT (//,1H0,20X,*NODAL POINT FORCES WITH SPECIFIED UNIFORM AND PINF 533
     1CONCENTRATED LOADS*,//)                                           PINF 534
      WRITE (IO,670)                                                    PINF 535
  670 FORMAT (1H0,20X,*CONCENTRATED NODAL POINT FORCES (KIPS AND IN-KIPSPINF 536
     1)*,///,6X,*NODAL POINT*,8X,*U-LOAD*,12X,*V-LOAD*,12X,*W-LOAD*,11X,PINF 537
     2*MX-LOAD*,11X,*MY-LOAD*,//)                                       PINF 538
C                                                                       PINF 539
      WRITE (IO,680) (M,FORCE(5*M-4),FORCE(5*M-3),FORCE(5*M-2),FORCE(5*MPINF 540
     1-1),FORCE(5*M),M=1,NUMNP)                                         PINF 541
  680 FORMAT (1H ,6X,I5,1X,5F18.5)                                      PINF 542
C                                                                       PINF 543
      A=0.                                                              PINF 544
      DO 690 M=1,NUMNP                                                  PINF 545
      A=A+FORCE(5*M-2)                                                  PINF 546
  690 CONTINUE                                                          PINF 547
      WRITE (IO,700) A                                                  PINF 548
  700 FORMAT (1H0,19X,*SUM OF NODAL POINT W-LOADS          =*,F11.4)    PINF 549
C                                                                       PINF 550
      IF (IDD.EQ.2) GO TO 1110                                          PINF 551
C                                                                       PINF 552
C     PRINT ELEMENT TOPOLOGY AND DIMENSIONS                             PINF 553
C                                                                       PINF 554
      WRITE (IO,220)                                                    PINF 555
C                                                                       PINF 556
C                                                                       PINF 557
      WRITE (IO,710)                                                    PINF 558
  710 FORMAT (1H0,//,20X,*ELEMENT TOPOLOGY *,//,6X,*NODAL POINT*,8X,*NEQPINF 559
     11*,8X,*NEQ2*,8X,*NEQ3*,8X,*NEQ4*,//)                              PINF 560
      WRITE (IO,720) (M,NEQ1(M),NEQ2(M),NEQ3(M),NEQ4(M),M=1,NUMNP)      PINF 561
  720 FORMAT (1H ,6X,I5,5X,4I12)                                        PINF 562
C                                                                       PINF 563
      WRITE (IO,730)                                                    PINF 564
  730 FORMAT (1H0,//,20X,*ELEMENT ARRAY*,///6X,14HELEMENT NUMBER,7X,1HI,PINF 565
     114X,1HJ,14X,1HK,14X,1HL,//)                                       PINF 566
C                                                                       PINF 567
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C                                                                       PINF 568
      WRITE (IO,740) (N,NPI(N),NPJ(N),NPK(N),NPL(N),N=1,NUMEL)          PINF 569
  740 FORMAT (6X,I5,10X,I5,10X,I5,10X,I5,10X,I5)                        PINF 570
      WRITE (IO,750)                                                    PINF 571
  750 FORMAT (1H0,//20X,*SLAB- ELEMENT GEOMETRY*,//)                    PINF 572
      WRITE (IO,760)                                                    PINF 573
  760 FORMAT (1H0,5X,*ELEMENT   LENGTH A    LENGTH B      DT  (DIMENSIONPINF 574
     1S ARE IN INCHES)*)                                                PINF 575
C                                                                       PINF 576
      WRITE (IO,770) (N,ELLA(N),ELLB(N),DT(N),N=1,NUMEL)                PINF 577
  770 FORMAT (1H0,4X,I5,2X,F10.4,2X,F10.4,2X,F10.4)                     PINF 578
C                                                                       PINF 579
C                                                                       PINF 580
C     READ INFORMATION ABOUT PLATE LAYERS                               PINF 581
C                                                                       PINF 582
      A=NULAY                                                           PINF 583
      A=1./A                                                            PINF 584
      B=-.5                                                             PINF 585
      DO 780 I=1,NULAY                                                  PINF 586
      PDT(I)=A                                                          PINF 587
      B=B+A/2.                                                          PINF 588
      PZC(I)=B                                                          PINF 589
      B=B+A/2.                                                          PINF 590
  780 CONTINUE                                                          PINF 591
      WRITE (IO,790)                                                    PINF 592
  790 FORMAT (1H0,/,20X,*SLAB- LAYER GEOMETRY*,//,6X,*LAYER     THICKNESPINF 593
     1S/DT*,5X,*CENTROID/DT*,//)                                        PINF 594
      WRITE (IO,800) (I,PDT(I),PZC(I),I=1,NULAY)                        PINF 595
  800 FORMAT (1H0,6X,I3,6X,F10.6,7X,F10.6)                              PINF 596
C                                                                       PINF 597
C     READ THE CONCRETE MATERIAL PROPERTIES                             PINF 598
C                                                                       PINF 599
      WRITE (IO,810)                                                    PINF 600
  810 FORMAT (1H0,//,20X,*SLAB- CONCRETE MATERIAL PROPERTIES (KSI)*)    PINF 601
      READ (IN,150) FC,FT,EC,EDOWNC,EDOWNT                              PINF 602
      IF (FT.NE.0.) GO TO 840                                           PINF 603
      DO 820 I=1,9                                                      PINF 604
      IF (FTFIND(I).GT.FC) GO TO 830                                    PINF 605
  820 CONTINUE                                                          PINF 606
  830 FT=(FTFIND(9+I)-FTFIND(8+I))*(FC-FTFIND(I-1))*FC                  PINF 607
      FT=FT/(FTFIND(I)-FTFIND(I-1))+FTFIND(8+I)*FC                      PINF 608
  840 CONTINUE                                                          PINF 609
      IF (EC.EQ.0.) EC=33.*(145.)**1.5*SQRT(FC*1000.)/1000.             PINF 610
      IF (EDOWNC.EQ.0.) EDOWNC=1000.                                    PINF 611
      IF (EDOWNT.EQ.0.) EDOWNT=800.                                     PINF 612
C                                                                       PINF 613
      WRITE (IO,850) FC,FT,EC,EDOWNC,EDOWNT                             PINF 614
  850 FORMAT (//,8X,*UNIAXIL CONCRETE COMPRESSIVE STRENGTH, FC    =*,F9.PINF 615
     14,//,8X,*DIRECT TENSILE STRENGTH, FT                    =*,F9.4,//,8PINF 616
     2X,*INITIAL MODULUS, EC                          =*,F9.2,//,8X,*UNLPINF 617
     3OADING MODULUS IN COMPRESSION                =*,F9.2,//,8X,*UNLOADINGPINF 618
     4 MODULUS IN TENSION                  =*,F9.2,1X)                 PINF 619
C                                                                       PINF 620
      V=.2                                                              PINF 621
      ALICC=-15.                                                        PINF 622
      ALMM=-19.2                                                        PINF 623
      SALMM=.85                                                         PINF 624
C                                                                       PINF 625
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      ECOMP=2500.                                                       PINF 626
      ET=FT/EC*1.0E+06                                                  PINF 627
      EALMM=.80                                                         PINF 628
      PCOMP=1150.                                                       PINF 629
C                                                                       PINF 630
      ZA=-.052                                                          PINF 631
      EZA=.125                                                          PINF 632
      ZB=-.203                                                          PINF 633
      EZB=1.0                                                           PINF 634
C                                                                       PINF 635
      NSMAT=0                                                           PINF 636
      IF (NSLAYR.EQ.0) GO TO 980                                        PINF 637
C                                                                       PINF 638
C     READ INFORMATION ABOUT STEEL LAYERS IN SLAB                       PINF 639
C     READ NUMBER OF DIFFERENT MATERIALS                                PINF 640
C                                                                       PINF 641
      READ (IN,860) NSMAT                                               PINF 642
  860 FORMAT (7I5)                                                      PINF 643
C                                                                       PINF 644
      IF (NSMAT.GT.4) WRITE (IO,870)                                    PINF 645
  870 FORMAT (1H0,//,11X,*MAXINUM NUMBER OF SLAB STEEL MATERIALS HAS BEEPINF 646
     1N EXCEEDED*,//)                                                   PINF 647
      IF (NSMAT.GT.4) STOP 1                                            PINF 648
C                                                                       PINF 649
      N=NSMAT                                                           PINF 650
C                                                                       PINF 651
C     READ MATERIAL PROPERTIES                                          PINF 652
C                                                                       PINF 653
      READ (IN,880) (I,SIGMAP(I),SEMOD(I),SPROM(I),SPRON(I),J=1,N)      PINF 654
  880 FORMAT (I5,4F10.0)                                                PINF 655
C                                                                       PINF 656
      DO 890 I=1,NSMAT                                                  PINF 657
      IF (SEMOD(I).EQ.0.) SEMOD(I)=29000.                               PINF 658
      IF (SPROM(I).EQ.0.) SPROM(I)=.7                                   PINF 659
      IF (SPRON(I).EQ.0.) SPRON(I)=100.                                 PINF 660
  890 CONTINUE                                                          PINF 661
C                                                                       PINF 662
C     WRITE INFORMATION ABOUT STEEL LAYERS                              PINF 663
C                                                                       PINF 664
      WRITE (IO,900)                                                    PINF 665
  900 FORMAT (1H0,//,20X,*SLAB - STEEL LAYER MATERIAL PROPERTIES*)      PINF 666
      WRITE (IO,910)                                                    PINF 667
  910 FORMAT (//7X,*MAT. TYPE     YOUNGS MODULUS      YIELD STRENGTH    PINF 668
     1   RAMBERG-M  RAMBERG-N*)                                         PINF 669
      WRITE (IO,920) (I,SEMOD(I),SIGMAP(I),SPROM(I),SPRON(I),I=1,N)     PINF 670
  920 FORMAT (11X,I1,10X,F8.2,* KSI*,9X,F8.2,* KSI*,9X,F5.2,5X,F5.1)    PINF 671
      WRITE (IO,930)                                                    PINF 672
  930 FORMAT (1H0,//,20X,*SLAB - STEEL LAYER GEOMETRY*)                 PINF 673
C                                                                       PINF 674
      WRITE (IO,940)                                                    PINF 675
  940 FORMAT (1H0,11X,*LAYER  MAT. TYPE  BAR NO.  SPACING (IN)  THICKNESPINF 676
     1S (IN)  CENTROID (IN)  ANGLE (DEGREES)*,//)                       PINF 677
C                                                                       PINF 678
C     READ LAYER GEOMETRY                                               PINF 679
C                                                                       PINF 680
      DO 970 I=1,NSLAYR                                                 PINF 681
      READ (IN,950) J,NSTYPE(J),ISIZE,SPACE,SZC(J),SPHI(J)              PINF 682
  950 FORMAT (3I5,3F10.0)                                               PINF 683
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      SDT(J)=SPACE                                                      PINF 684
      IF (ISIZE.GT.C) SDT(J)=BARSZ(ISIZE)/SPACE                         PINF 685
      IF (ISIZE.LE.0) SPACE=0.0                                         PINF 686
      WRITE (IO,960) J,NSTYPE(J),ISIZE,SPACE,SDT(J),SZC(J),SPHI(J)      PINF 687
  960 FORMAT (1H ,11X,I5,3X,I5,5X,I5,6X,F9.4,6X,F9.5,7X,F9.5,6X,F8.3)   PINF 688
  970 CONTINUE                                                          PINF 689
  980 CONCTINUE                                                         PINF 690
C                                                                       PINF 691
C     READ IN THE TERMINATICN CHECKS                                    PINF 692
C                                                                       PINF 693
C     READ IN THE NUMBER OF CARDS TO SPECIFY THE CHECKS                 PINF 694
C                                                                       PINF 695
      READ (IN,880) NC                                                  PINF 696
      WRITE (IO,990) NC                                                 PINF 697
  990 FORMAT (1H0,//,6X,*NUMBER OF CARDS TO SPECIFY TERMINATION CHECKS =PINF 698
     1 *,I2,/)                                                          PINF 699
      IF (NC.GT.(NSMAT+1)) STOP 1                                       PINF 700
C                                                                       PINF 701
      WRITE (IO,1000)                                                   PINF 702
 1000 FORMAT (1H0,/,21X,*TERMINATION CHECKS FOR THE SLAB LAYERS*,/,21X,*PINF 703
     1(STRESS IN KSI, STRAIN IN PERCENT)*,//,6X,*MAT. NO.  MAX STRAIN  MPINF 704
     2AX TENSILE  MAX COMP  NUMBER OF CRACKED    NUMBER OF*,/,31X,*STRESPINF 705
     3S     STRESS   OR YIELDED LAYERS  CRUSHED LAYERS*,//)            PINF 706
C                                                                       PINF 707
      IF (NC.EQ.0) GO TO 1020                                           PINF 708
C                                                                       PINF 709
      READ (IN,1010) (J,STRAMS(J+1),STTEMS(J+1),STCEMS(J+1),NKS(J+1),NHSPINF 710
     1(J+1),I=1,NC)                                                     PINF 711
 1010 FORMAT (I5,3F10.C,2I5)                                            PINF 712
C                                                                       PINF 713
 1020 CONTINUE                                                          PINF 714
C                                                                       PINF 715
C     PRINT OUT CHECKS AND SET UP DEFAULT VALUES                        PINF 716
C                                                                       PINF 717
      N=NSMAT+1                                                         PINF 718
      DO 1050 J=1,N                                                     PINF 719
C                                                                       PINF 720
      L=J-1                                                             PINF 721
      A=.0025                                                           PINF 722
      B=6.0*SQRT(FC*1000.0)/1000.0                                      PINF 723
      C=0.8*FC                                                          PINF 724
      I = 1                                                             PINF 725
      K=1                                                               PINF 726
      IF (J.EQ.1) GO TO 1030                                            PINF 727
C                                                                       PINF 728
      A=SIGMAP(L)/(SPRON(L)*SEMOD(L))                                   PINF 729
      B=SIGMAP(L)                                                       PINF 730
      C=SIGMAP(L)                                                       PINF 731
      I=1                                                               PINF 732
      K=0                                                               PINF 733
C                                                                       PINF 734
 1030 CONTINUE                                                          PINF 735
      A=A*100.                                                          PINF 736
      IF (STRAMS(J).LT.0.0) STRAMS(J)=A                                 PINF 737
      IF (STTEMS(J).LT.0.0) STTEMS(J)=B                                 PINF 738
      IF (STCEMS(J).LT.0.0) STCEMS(J)=C                                 PINF 739
      IF (NKS(J).LT.0) NKS(J)=I                                         PINF 740
      IF (NHS(J).LT.0) NHS(J)=K                                         PINF 741
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C                                                                       PINF 742
      WRITE (IO,1040) L,STRAMS(J),STTEMS(J),STCEMS(J),NKS(J),NHS(J)     PINF 743
 1040 FORMAT (1H ,7X,I5,4X,F8.3,4X,F8.3,4X,F8.3,8X,I5,11X,I5)           PINF 744
C                                                                       PINF 745
      STRAMS(J)=STRAMS(J)/100.                                          PINF 746
 1050 CONTINUE                                                          PINF 747
C                                                                       PINF 748
C                                                                       PINF 749
C     SET UP RATIOS USED FOR THE BIAXIALLY STRESSED CONCRETE            PINF 750
C                                                                       PINF 751
      STRAMS(1)=STRAMS(1)/0.0025                                        PINF 752
      STTEMS(1)=STTEMS(1)/FT                                            PINF 753
      STCEMS(1)=STCEMS(1)/FC                                            PINF 754
C                                                                       PINF 755
C                                                                       PINF 756
C     READ CRACK WIDTH DATA                                             PINF 757
C                                                                       PINF 758
C     READ FOR TOP SURFACE                                              PINF 759
C                                                                       PINF 760
      READ (IN,150) ACR(2),CMIN(2),WCMAX(2)                             PINF 761
      IF (WCMAX(2).LE.0.0) WCMAX(2)=0.004                               PINF 762
      A=3HTOP                                                           PINF 763
      B=3H                                                              PINF 764
      WRITE (IO,1060) A,B,ACR(2),CMIN(2),WCMAX(2)                       PINF 765
 1060 FORMAT (//,6X,A3,A3,* SURFACE OF SLAB*,* (IN)*,//,13X,*BAR SPACINGPINF 766
     1*,15X,*= *,F8.3,//,13X,*CONCRETE COVER*,12X,*= *,F8.3,//,13X,*MAX PINF 767
     2ALLOWABLE CRACK WIDTH = *,F8.5,//)                                PINF 768
C                                                                       PINF 769
C     READ FOR BOTTOM SURFACE                                           PINF 770
C                                                                       PINF 771
      READ (IN,150) ACR(1),CMIN(1),WCMAX(1)                             PINF 772
      IF (WCMAX(1).LE.0.0) WCMAX(1)=0.004                               PINF 773
      A=3HBOT                                                           PINF 774
      B=3HTOM                                                           PINF 775
      WRITE (IO,1060) A,B,ACR(1),CMIN(1),WCMAX(1)                       PINF 776
      ACR(2)=SQRT(ACR(2)**2/4.+CMIN(2)**2)                              PINF 777
      ACR(1)=SQRT(ACR(1)**2/4.+CMIN(1)**2)                              PINF 778
C                                                                       PINF 779
C     FIND REF NODE                                                     PINF 780
C                                                                       PINF 781
      IF (NSIGNI(1).NE.0.AND.NSIGNI(2).NE.0) GO TO 1090                 PINF 782
      DO 1070 M=1,5                                                     PINF 783
      DO 1070 I=1,NUMNP                                                 PINF 784
      J=(I-1)*5+M                                                       PINF 785
      IF (FORCE(J).NE.0.0.AND.LILA(J).EQ.0) GO TO 1080                  PINF 786
 1070 CONTINUE                                                          PINF 787
      J=3                                                               PINF 788
 1080 NSIGNI(1)=J                                                       PINF 789
      NSIGNI(2)=J                                                       PINF 790
 1090 CONTINUE                                                          PINF 791
C                                                                       PINF 792
      REWIND 29                                                         PINF 793
      WRITE (29) FORCE,LILA                                             PINF 794
      REWIND 5                                                          PINF 795
      WRITE (5) XSEG,YSEG                                               PINF 796
      IF (IDEAD.EQ.3HYES) WRITE (IO,1100)                               PINF 797
 1100 FORMAT (1H0,//,20X,*DEAD LOAD FORCES*)                            PINF 798
      IF (IDEAD.EQ.3HYES) GO TO 310                                     PINF 799
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      GO TO 1120                                                        PINF 800
 1110 CONTINUE                                                          PINF 801
      WRITE (29) FORCE                                                  PINF 802
C                                                                       PINF 803
 1120 CONTINUE                                                          PINF 804
C                                                                       PINF 805
C     PRINT SUMMARY OF BOUNDARY CONDITIONS                              PINF 806
C                                                                       PINF 807
      WRITE (IO,1130)                                                   PINF 808
 1130 FORMAT (1HO,//,20X,*BOUNDARY CONDITIONS*,//)                      PINF 809
C                                                                       PINF 810
      I=0                                                               PINF 811
      J=0                                                               PINF 812
      DO 1140 M=1,NUMNP                                                 PINF 813
      L=5*M-4                                                           PINF 814
      IF (LILA(L).NE.0) I=I+1                                           PINF 815
      IF (LILA(L).NE.0) NEQ1(I)=M                                       PINF 816
      L=L+1                                                             PINF 817
      IF (LILA(L).NE.0) J=J+1                                           PINF 818
      IF (LILA(L).NE.0) NEQ2(J)=M                                       PINF 819
 1140 CONTINUE                                                          PINF 820
      IF (I.EQ.0) NEQ1(1)=0                                             PINF 821
      IF (J.EQ.0) NEQ2(1)=0                                             PINF 822
      IF (I.EQ.0) I=1                                                   PINF 823
      IF (J.EQ.0) J=1                                                   PINF 824
C                                                                       PINF 825
C                                                                       PINF 826
      WRITE (IO,1150) (NEQ1(M),M=1,I)                                   PINF 827
 1150 FORMAT (1HO,5X,* U CONSTRAINED NODES ARE *,10(2X,I3),(/,5X,26X,10(PINF 828
     12X,I3)))                                                          PINF 829
C                                                                       PINF 830
      WRITE (IO,220)                                                    PINF 831
      WRITE (IO,1160) (NEQ2(M),M=1,J)                                   PINF 832
 1160 FORMAT (1HO,5X,* V CONSTRAINED NODES ARE *,10(2X,I3),(/,5X,26X,10(PINF 833
     12X,I3)))                                                          PINF 834
C                                                                       PINF 835
      I=0                                                               PINF 836
      J=0                                                               PINF 837
      N=0                                                               PINF 838
      DO 1170 M=1,NUMNP                                                 PINF 839
      L=5*M-2                                                           PINF 840
      IF (LILA(L).NE.0) I=I+1                                           PINF 841
      IF (LILA(L).NE.0) NEQ1(I)=M                                       PINF 842
      L=L+1                                                             PINF 843
      IF (LILA(L).NE.0) J=J+1                                           PINF 844
      IF (LILA(L).NE.0) NEQ2(J)=M                                       PINF 845
      L=L+1                                                             PINF 846
      IF (LILA(L).NE.0) N=N+1                                           PINF 847
      IF (LILA(L).NE.0) NEQ3(N)=M                                       PINF 848
 1170 CONTINUE                                                          PINF 849
      IF (I.EQ.0) NEQ1(1)=0                                             PINF 850
      IF (J.EQ.0) NEQ2(1)=0                                             PINF 851
      IF (N.EQ.0) NEQ3(1)=0                                             PINF 852
      IF (I.EQ.0) I=1                                                   PINF 853
      IF (J.EQ.0) J=1                                                   PINF 854
      IF (N.EQ.0) N=1                                                   PINF 855
C                                                                       PINF 856
C                                                                       PINF 857
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      WRITE (IO,220)                                                    PINF 858
      WRITE (IO,1180) (NEQ1(M),M=1,I)                                   PINF 859
 1180 FORMAT (1H0,5X,* W CONSTRAINED NODES ARE *,10(2X,I3),(/,5X,26X,10(PINF 860
     12X,I3)))                                                          PINF 861
C                                                                       PINF 862
      WRITE (IO,220)                                                    PINF 863
      WRITE (IO,1190) (NEQ2(M),M=1,J)                                   PINF 864
 1190 FORMAT (1H0,5X,*MX CONSTRAINED NODES ARE *,10(2X,I3),(/,5X,26X,10(PINF 865
     12X,I3)))                                                          PINF 866
C                                                                       PINF 867
      WRITE (IO,220)                                                    PINF 868
      WRITE (IO,1200) (NEQ3(M),M=1,N)                                   PINF 869
 1200 FORMAT (1H0,5X,*MY CONSTRAINED NODES ARE *,10(2X,I3),(/,5X,26X,10(PINF 870
     12X,I3)))                                                          PINF 871
C                                                                       PINF 872
      IF (NBEAMX.EQ.0) RETURN                                           PINF 873
      WRITE (IO,1210)                                                   PINF 874
 1210 FORMAT (1H1,////)                                                 PINF 875
C                                                                       PINF 876
C     READ IN THE NUMBER OF BEAMS AND STARTING NODE POINTS              PINF 877
C                                                                       PINF 878
      WRITE (IO,220)                                                    PINF 879
      WRITE (IO,1220) NOBM                                              PINF 880
 1220 FORMAT (1H0,5X,*NUMBER OF BEAMS =*,I3)                            PINF 881
C                                                                       PINF 882
      WRITE (IO,220)                                                    PINF 883
      NB=NELX+1                                                         PINF 884
      DO 1240 I=1,NOBM                                                  PINF 885
C                                                                       PINF 886
      N=NPBEAM(I)                                                       PINF 887
      IF (PRED.NE.3HYES) READ (IN,240) N                                PINF 888
      WRITE (IO,1230) I,N                                               PINF 889
 1230 FORMAT (1H0,5X,*BEAM NUMBER =*,I3,* STARTING NODE POINT =*,I3)    PINF 890
C                                                                       PINF 891
C     WRITE BOUNDARY CONDITIONS FOR BEAMS TO TAPE                       PINF 892
C                                                                       PINF 893
      NPBEAM(I)=N                                                       PINF 894
      WRITE (5) N                                                       PINF 895
      DO 1240 J=1,NB                                                    PINF 896
      M=N+J-1                                                           PINF 897
 1240 WRITE (5) LILA(5*M-4),LILA(5*M-2),LILA(5*M)                       PINF 898
C                                                                       PINF 899
C                                                                       PINF 900
      RETURN                                                            PINF 901
      END                                                               PINF 902
      SUBROUTINE GELOAD (Q,NANA,NUMNP,NA1,NUMEL,NPI,NPJ,NPK,NPL,NEQ1,NEQGELOAD 2
     12,NEQ3,NEQ4,ELLA,ELLB,FORCE)                                      GELOAD 3
C                                                                       GELOAD 4
C     COMPUTE NODAL POINT FORCES FROM DISTRIBUTED LOADS                 GELOAD 5
C     ADD RESULTING NODAL POINT FORCES TO THE FORCE VECTOR              GELOAD 6
C                                                                       GELOAD 7
C                                                                       GELOAD 8
      DIMENSION NPI(NANA), NPJ(NANA), NPK(NANA), NPL(NANA), NEQ1(NUMNP),GELOAD 9
     1 NEQ2(NUMNP), NEQ3(NUMNP), NEQ4(NUMNP), Q(NUMEL), ELLA(NUMEL), ELLGELOAD10
     2B(NUMEL), FORCE(NA1), NZ(4)                                       GELOAD11
      DIMENSION FF(3), FFT(3)                                           GELOAD12
C                                                                       GELOAD13
      COMMON /SKEW/ PHI,AU(2,2),AO(3,3),DS(3,3)                         GELOAD14
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C                                                                       GELOAD15
      SINA=PHI*ATAN(1.0)/45.                                            GELOAD16
      SINA=SIN(SINA)                                                    GELOAD17
C                                                                       GELOAD18
C     SET UP LOCATIONS AND INITIALIZE                                   GELOAD19
C                                                                       GELOAD20
      DO 100 M=1,NUMNP                                                  GELOAD21
      NZ(1)=NEQ1(M)                                                     GELOAD22
      NZ(2)=NEQ2(M)                                                     GELOAD23
      NZ(3)=NEQ3(M)                                                     GELOAD24
      NZ(4)=NEQ4(M)                                                     GELOAD25
      N1=NZ(1)                                                          GELOAD26
      N2=NZ(2)                                                          GELOAD27
      N3=NZ(3)                                                          GELOAD28
      N4=NZ(4)                                                          GELOAD29
      Z1 = 0.                                                           GELOAD30
      Z2 = 0.                                                           GELOAD31
      Z3 = 0.                                                           GELOAD32
      Z4 = 0.                                                           GELOAD33
      X1 = 0.                                                           GELOAD34
      X2 = 0.                                                           GELOAD35
      X3 = 0.                                                           GELOAD36
      X4 = 0.                                                           GELOAD37
      Y1 = 0.                                                           GELOAD38
      Y2 = 0.                                                           GELOAD39
      Y3 = 0.                                                           GELOAD40
      Y4 = 0.                                                           GELOAD41
C                                                                       GELOAD42
C     ELEMENT NEQ1 NODE I CONTRIBUTES                                   GELOAD43
C                                                                       GELOAD44
      N=N1                                                              GELOAD45
      IF (N.EQ.NANA) GO TO 10                                           GELOAD46
      FAC=Q(N)*ELLA(N)*ELLB(N)*4.0                                      GELOAD47
      Z1=FAC/4.0                                                        GELOAD48
      X1=-FAC*ELLB(N)/12.0                                              GELOAD49
      Y1=-FAC*ELLA(N)/12.0                                              GELOAD50
   10 CONTINUE                                                          GELOAD51
C                                                                       GELOAD52
C     ELEMENT NEQ4 NODE J CONTRIBUTES                                   GELOAD53
C                                                                       GELOAD54
      N=N4                                                              GELOAD55
      IF (N.EQ.NANA) GO TO 20                                           GELOAD56
      FAC=Q(N)*ELLA(N)*ELLB(N)*4.0                                      GELOAD57
      Z4=FAC/4.0                                                        GELOAD58
      X4=+FAC*ELLB(N)/12.0                                              GELOAD59
      Y4=-FAC*ELLA(N)/12.0                                              GELOAD60
   20 CONTINUE                                                          GELOAD61
C                                                                       GELOAD62
C     ELEMENT NEQ2 NODE K CONTRIBUTES                                   GELOAD63
C                                                                       GELOAD64
      N=N2                                                              GELOAD65
      IF (N.EQ.NANA) GO TO 30                                           GELOAD66
      FAC=Q(N)*ELLA(N)*ELLB(N)*4.0                                      GELOAD67
      Z2=FAC/4.0                                                        GELOAD68
      X2=-FAC*ELLB(N)/12.0                                              GELOAD69
      Y2=+FAC*ELLA(N)/12.0                                              GELOAD70
   30 CONTINUE                                                          GELOAD71
C                                                                       GELOAD72
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C     ELEMENT NEQ3 NODE L CONTRIBUTES                                   GELOAD73
C                                                                       GELOAD74
      N=N3                                                              GELOAD75
      IF (N.EQ.NANA) GO TO 40                                           GELOAD76
      FAC=Q(N)*ELLA(N)*ELLB(N)*4.0                                      GELOAD77
      Z3=FAC/4.0                                                        GELOAD78
      X3=+FAC*ELLB(N)/12.0                                              GELOAD79
      Y3=+FAC*ELLA(N)/12.0                                              GELOAD80
   40 CONTINUE                                                          GELOAD81
C                                                                       GELOAD82
C     ADD TO FORCE VECTOR                                               GELOAD83
C                                                                       GELOAD84
      FF(1)=Z1+Z2+Z3+Z4                                                 GELOAD85
      FF(2)=X1+X2+X3+X4                                                 GELOAD86
      FF(3)=Y1+Y2+Y3+Y4                                                 GELOAD87
C                                                                       GELOAD88
C                                                                       GELOAD89
      IF (ABS(PHI).EQ.90.) GO TO 80                                     GELOAD90
C                                                                       GELOAD91
C     TRANSFORM TO CARTESIAN                                            GELOAD92
C                                                                       GELOAD93
C                                                                       GELOAD94
      DO 60 I=1,3                                                       GELOAD95
      SUM=0.                                                            GELOAD96
      DO 50 J=1,3                                                       GELOAD97
   50 SUM=SUM+AO(I,J)*FF(J)                                             GELOAD98
   60 FFT(I)=SUM*SINA                                                   GELOAD99
C                                                                       GELOA100
      DO 70 I=1,3                                                       GELOA101
   70 FF(I)=FFT(I)                                                      GELOA102
C                                                                       GELOA103
   80 CONTINUE                                                          GELOA104
C                                                                       GELOA105
C                                                                       GELOA106
      J=5*M-3                                                           GELOA107
      DO 90 I=1,3                                                       GELOA108
   90 FORCE(J+I)=FORCE(J+I)+FF(I)                                       GELOA109
C                                                                       GELOA110
  100 CONTINUE                                                          GELOA111
      RETURN                                                            GELOA112
      END                                                               GELOA113
      SUBROUTINE FOVEC                                                  GELOA114
      RETURN                                                            GELOA115
      END                                                               GELOA116
      SUBROUTINE COLOAD (NELX,NELY,NA1,NANA,IN,IO,XSEG,YSEG,FORCE,NPI,NPCOLOAD 2
     1J,NPK,NPL)                                                        COLOAD 3
C                                                                       COLOAD 4
C     READ THE CONCENTRATED LOADS WITHIN THE ELEMENT, COMPUTE           COLOAD 5
C          THE RESULTING NODAL POINT LOADS, AND ADD TO                  COLOAD 6
C          THE FORCE VECTOR                                             COLOAD 7
C                                                                       COLOAD 8
      DIMENSION XSEG(NELX), YSEG(NELY), FORCE(NA1), NPI(NANA), NPJ(NANA)COLOAD 9
     1, NPK(NANA), NPL(NANA)                                            COLOAD10
      DIMENSION FF(12), FFT(12)                                         COLOAD11
C                                                                       COLOAD12
      COMMON /SKEW/ PHI,AU(2,2),AO(3,3),DS(3,3)                         COLOAD13
C                                                                       COLOAD14
C                                                                       COLOAD15
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      DIMENSION CB(12,12), CCB(12,12), PQ(12), NZ(4)                    COLOAD16
C                                                                       COLOAD17
      EQUIVALENCE (ZI,PQ(1)), (XMI,PQ(2)), (YMI,PQ(3))                 COLOAD18
      EQUIVALENCE (ZJ,PQ(4)), (XMJ,PQ(5)), (YMJ,PQ(6))                 COLOAD19
      EQUIVALENCE (ZK,PQ(7)), (XMK,PQ(8)), (YMK,PQ(9))                 COLOAD20
      EQUIVALENCE (ZL,PQ(10)), (XML,PQ(11)), (YML,PQ(12))              COLOAD21
      EQUIVALENCE (PQ,FF)                                               COLOAD22
C                                                                       COLOAD23
      DATA ((CB(I,J),I=1,12),J=1,12)/.250,-.375,.375,0.000,-.500,0.000,.COLOAD24
     1125,0.000,0.000,-.125,.125,.125,-.125,.125,-.125,0.000,.125,.125,0COLOAD25
     2.000,0.000,-.125,.125,0.000,-.125,-.125,.125,-.125,.125,.125,0.000COLOAD26
     3,-.125,.125,0.000,0.000,-.125,0.000,.250,-.375,-.375,0.000,.500,0.COLOAD27
     4000,.125,0.000,0.000,.125,-.125,-.125,.125,-.125,-.125,0.000,.125,COLOAD28
     5-.125,0.000,0.000,.125,.125,0.000,-.125,-.125,.125,.125,.125,-.125COLOAD29
     6,0.000,-.125,-.125,0.000,0.000,.125,0.000,.250,.375,.375,0.000,.5COLOAD30
     70,0.000,-.125,0.000,0.000,-.125,-.125,-.125,-.125,-.125,-.125,0.0COLOAD31
     80,-.125,.125,0.000,0.000,.125,.125,0.000,.125,.125,.125,.125,-.125COLOAD32
     9,.125,0.000,-.125,-.125,0.000,0.000,-.125,0.000,.250,.375,-.375,0.COLOAD33
     $000,-.500,0.000,-.125,0.000,0.000,.125,.125,.125,.125,.125,-.125,0COLOAD34
     $.000,-.125,-.125,0.000,0.000,-.125,.125,0.000,.125,.125,.125,-.125COLOAD35
     $,-.125,-.125,0.000,-.125,.125,0.000,0.000,.125,0.000/             COLOAD36
C                                                                       COLOAD37
C                                                                       COLOAD38
C     READ NUMBER OF CONCENTRATED LOAD CARDS                            COLOAD39
C                                                                       COLOAD40
      WRITE (IO,10)                                                     COLOAD41
   10 FORMAT (1H )                                                      COLOAD42
      READ (IN,20) NC                                                   COLOAD43
   20 FORMAT (I5)                                                       COLOAD44
      WRITE (IO,30) NC                                                  COLOAD45
   30 FORMAT (1H0,5X,*NUMBER OF CONCENTRATED LOAD CARDS =*,I5)          COLOAD46
      IF (NC.EQ.0) GO TO 180                                            COLOAD47
C                                                                       COLOAD48
      WRITE (IO,40)                                                     COLOAD49
   40 FORMAT (1H0,5X,*LOAD CARD   LOAD (KIPS)   X-POSITION (IN)   Y-POSICOLOAD50
     1TION (IN)*,//)                                                    COLOAD51
C                                                                       COLOAD52
C     READ LOAD AND LOCATION                                            COLOAD53
C                                                                       COLOAD54
      DO 170 I=1,NC                                                     COLOAD55
C                                                                       COLOAD56
      READ (IN,50) P,X,Y                                                COLOAD57
   50 FORMAT (8F10.0)                                                   COLOAD58
      WRITE (IO,60) I,P,X,Y                                             COLOAD59
   60 FORMAT (1H ,11X,I3,5X,F9.4,5X,F8.2,10X,F8.2,5X,F8.2,5X,F8.2)      COLOAD60
C                                                                       COLOAD61
C     LOCATE ELEMENT                                                    COLOAD62
C                                                                       COLOAD63
      DISTX=0.                                                          COLOAD64
      DO 70 J=1,NELX                                                    COLOAD65
      XL=XSEG(J)                                                        COLOAD66
      DISTX=DISTX+XL                                                    COLOAD67
      IF ((DISTX+.001).GE.X) GO TO 90                                   COLOAD68
   70 CONTINUE                                                          COLOAD69
      WRITE (IO,80)                                                     COLOAD70
   80 FORMAT (1H0,5X,20(1H*),*INCORRECT LOAD POSITION-ABORT FROM SUBROUTCOLOAD71
     1INE COLOAD*,//)                                                   COLOAD72
      STOP 5                                                            COLOAD73
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   90 CONTINUE                                                          COLOAD74
      DISTY=0.                                                          COLOAD75
      DO 100 K=1,NELY                                                   COLOAD76
      YL=YSEG(K)                                                        COLOAD77
      DISTY=DISTY+YL                                                    COLOAD78
      IF ((DISTY+.001).GE.Y) GO TO 110                                  COLOAD79
  100 CONTINUE                                                          COLOAD80
      WRITE (IO,80)                                                     COLOAD81
      STOP 5                                                            COLOAD82
  110 CONTINUE                                                          COLOAD83
C                                                                       COLOAD84
C     FIND FIXED END FORCES                                             COLOAD85
C                                                                       COLOAD86
      A=XL*YL                                                           COLOAD87
      XB=DISTX-X                                                        COLOAD88
      YB=DISTY-Y                                                        COLOAD89
      XA=XL-XB                                                          COLOAD90
      YA=YL-YB                                                          COLOAD91
C                                                                       COLOAD92
C     COMPUTE VERTICAL FORCE                                            COLOAD93
C                                                                       COLOAD94
      ZI=P*XB*YB/A                                                      COLOAD95
      ZJ=P*XB*YA/A                                                      COLOAD96
      ZK=P*XA*YB/A                                                      COLOAD97
      ZL=P*XA*YA/A                                                      COLOAD98
C                                                                       COLOAD99
C     COMPUTE MOMENTS AROUND X-AXIS                                     COLOA100
C                                                                       COLOA101
      XMI=-P*YB*YB*YA*XB/A/YL                                           COLOA102
      XMJ=+P*YA*YA*YB*XB/A/YL                                           COLOA103
      XMK=-P*YB*YB*YA*XA/A/YL                                           COLOA104
      XML=+P*YA*YA*YB*XA/A/YL                                           COLOA105
C                                                                       COLOA106
C     COMPUTE MOMENTS AROUND Y-AXIS                                     COLOA107
C                                                                       COLOA108
      YMI=-P*XB*XB*XA*YB/A/XL                                           COLOA109
      YMJ=-P*XB*XB*XA*YA/A/XL                                           COLOA110
      YMK=+P*XA*XA*XB*YB/A/XL                                           COLOA111
      YML=+P*XA*XA*XB*YA/A/XL                                           COLOA112
C                                                                       COLOA113
      FF(1)=ZI                                                          COLOA114
      FF(2)=XMI                                                         COLOA115
      FF(3)=YMI                                                         COLOA116
      FF(4)=ZJ                                                          COLOA117
      FF(5)=XMJ                                                         COLOA118
      FF(6)=YMJ                                                         COLOA119
      FF(7)=ZK                                                          COLOA120
      FF(8)=XMK                                                         COLOA121
      FF(9)=YMK                                                         COLOA122
      FF(10)=ZL                                                         COLOA123
      FF(11)=XML                                                        COLOA124
      FF(12)=YML                                                        COLOA125
C                                                                       COLOA126
C     ADD TO FORCE VECTOR                                               COLOA127
C                                                                       COLOA128
      M=J+NELX*(K-1)                                                    COLOA129
      NZ(1)=NPI(M)                                                      COLOA130
      NZ(2)=NPJ(M)                                                      COLOA131
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      NZ(3)=NPK(M)                                                      COLOA132
      NZ(4)=NPL(M)                                                      COLOA133
C                                                                       COLOA134
      IF (ABS(PHI).EQ.90.) GO TO 150                                    COLOA135
C                                                                       COLOA136
C     TRANSFORM TO CARTESIAN                                            COLOA137
C                                                                       COLOA138
      DO 130 K=1,12,3                                                   COLOA139
      DO 130 J=1,3                                                      COLOA140
      SUM=0.                                                            COLOA141
      DO 120 L=1,3                                                      COLOA142
  120 SUM=SUM+AO(J,L)*FF(K+L-1)                                         COLOA143
  130 FFT(K+J-1)=SUM                                                    COLOA144
C                                                                       COLOA145
      DO 140 J=1,12                                                     COLOA146
  140 FF(J)=FFT(J)                                                      COLOA147
C                                                                       COLOA148
  150 CONTINUE                                                          COLOA149
C                                                                       COLOA150
      DO 160 J=1,4                                                      COLOA151
      II=NZ(J)*5-3                                                      COLOA152
      DO 160 K=1,3                                                      COLOA153
      JJ=(J-1)*3+K                                                      COLOA154
      KK=II+K                                                           COLOA155
  160 FORCE(KK)=FORCE(KK)+PQ(JJ)                                        COLOA156
C                                                                       COLOA157
  170 CONTINUE                                                          COLOA158
C                                                                       COLOA159
  180 CONTINUE                                                          COLOA160
C                                                                       COLOA161
C     READ THE NUMBER OF PATCH LOAD CARDS                               COLOA162
C                                                                       COLOA163
      READ (IN,20) NC                                                   COLOA164
      WRITE (IO,190) NC                                                 COLOA165
  190 FORMAT (1H0,5X,*NUMBER OF PATCH LOAD CARDS*,8X,*=*,I5)            COLOA166
C                                                                       COLOA167
      IF (NC.EQ.0) RETURN                                               COLOA168
      WRITE (IO,200)                                                    COLOA169
  200 FORMAT (1H0,5X,*LOAD CARD    LOAD (KSI)    X OF CENTER(IN)  Y OF CCOLOA170
     1 ENTER(IN)  LENGTH(IN)   WIDTH(IN)*)                              COLOA171
C                                                                       COLOA172
      SINA=PHI*ATAN(1.0)/45.                                            COLOA173
      SINA=SIN(SINA)                                                    COLOA174
      DO 300 NI=1,NC                                                    COLOA175
C                                                                       COLOA176
      READ (IN,50) Q,X,Y,XLL,YLL                                        COLOA177
      WRITE (IO,60) NI,Q,X,Y,XLL,YLL                                    COLOA178
C                                                                       COLOA179
      DISTY2=0.                                                         COLOA180
      DO 290 K=1,NELY                                                   COLOA181
      YL=YSEG(K)                                                        COLOA182
      DISTY1=DISTY2                                                     COLOA183
      DISTY2=DISTY2+YL                                                  COLOA184
C                                                                       COLOA185
      DISTX2=0.                                                         COLOA186
      DO 290 J=1,NELX                                                   COLOA187
      XL=XSEG(J)                                                        COLOA188
      DISTX1=DISTX2                                                     COLOA189
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      DISTX2=DISTX2+XL                                                  COL0A190
C                                                                       COL0A191
      IF ((X-XLL/2.).GE.DISTX2.OR.(X+XLL/2.).LE.DISTX1) GO TO 290       COL0A192
      IF ((Y-YLL/2.).GE.DISTY2.OR.(Y+YLL/2.).LE.DISTY1) GO TO 290       COL0A193
C                                                                       COL0A194
      A1=X-XLL/2.-DISTX1-XL/2.                                          COL0A195
      A2=X+XLL/2.-DISTX1-XL/2.                                          COL0A196
      B1=DISTY1+YL/2.-Y-YLL/2.                                          COL0A197
      B2=DISTY1+YL/2.-Y+YLL/2.                                          COL0A198
C                                                                       COL0A199
      IF (A1.EQ.0.0) A1=1.0E-06                                         COL0A200
      IF (A2.EQ.0.0) A2=1.0E-06                                         COL0A201
      IF (B1.EQ.0.0) B1=1.0E-06                                         COL0A202
      IF (B2.EQ.0.0) B2=1.0E-06                                         COL0A203
C                                                                       COL0A204
      IF (A1.LT.-XL/2.) A1=-XL/2.                                       COL0A205
      IF (A2.GT.XL/2.) A2=XL/2.                                         COL0A206
      IF (B1.LT.-YL/2.) B1=-YL/2.                                       COL0A207
      IF (B2.GT.YL/2.) B2=YL/2.                                         COL0A208
C                                                                       COL0A209
      A=XL/2.                                                           COL0A210
      B=YL/2.                                                           COL0A211
      A2=A2/A                                                           COL0A212
      A1=A1/A                                                           COL0A213
      B2=B2/B                                                           COL0A214
      B1=B1/B                                                           COL0A215
      CALL PATCHL (PQ,A2,A1,B2,B1,A,B)                                  COL0A216
C                                                                       COL0A217
      DO 210 I=1,12                                                     COL0A218
      DO 210 L=1,12,3                                                   COL0A219
      CCB(I,L)=CB(I,L)                                                  COL0A220
      CCB(I,L+1)=CB(I,L+1)*B                                            COL0A221
  210 CCB(I,L+2)=CB(I,L+2)*A                                            COL0A222
C                                                                       COL0A223
      DO 230 I=1,12                                                     COL0A224
      SUM=0.                                                            COL0A225
      DO 220 L=1,12                                                     COL0A226
  220 SUM=SUM+CCB(L,I)*PQ(L)                                            COL0A227
  230 CCB(1,I)=SUM                                                      COL0A228
C                                                                       COL0A229
      M=(K-1)*NELX+J                                                    COL0A230
      NZ(1)=NPI(M)                                                      COL0A231
      NZ(2)=NPJ(M)                                                      COL0A232
      NZ(3)=NPK(M)                                                      COL0A233
      NZ(4)=NPL(M)                                                      COL0A234
C                                                                       COL0A235
C                                                                       COL0A236
      IF (ABS(PHI).EQ.90.) GO TO 270                                    COL0A237
C                                                                       COL0A238
C     TRANSFORM TO CARTESIAN                                            COL0A239
C                                                                       COL0A240
      DO 250 KKK=1,12,3                                                 COL0A241
      DO 250 JJJ=1,3                                                    COL0A242
      SUM=0.                                                            COL0A243
C                                                                       COL0A244
      DO 240 L=1,3                                                      COL0A245
  240 SUM=SUM+AO(JJJ,L)*CCB(1,KKK+L-1)                                  COL0A246
C                                                                       COL0A247
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```
  250 FFT(KKK+JJJ-1)=SUM                                                COLOA249
      DO 260 JJJ=1,12                                                   COLOA249
  260 CCB(1,JJJ)=FFT(JJJ)*SINA                                          COLOA250
C                                                                       COLOA251
  270 CONTINUE                                                          COLOA252
C                                                                       COLOA253
      DO 280 I=1,4                                                      COLOA254
      II=NZ(I)*5-3                                                      COLOA255
      DO 280 L=1,3                                                      COLOA256
      JJ=(I-1)*3+L                                                      COLOA257
      KK=II+L                                                           COLOA258
  280 FORCE(KK)=FORCE(KK)+CCB(1,JJ)*Q                                   COLOA259
C                                                                       COLOA260
  290 CONTINUE                                                          COLOA261
  300 CONTINUE                                                          COLOA262
C                                                                       COLOA263
C                                                                       COLOA264
      RETURN                                                            COLOA265
      END                                                               COLOA266
      SUBROUTINE PATCHL (P,A2,A1,B2,B1,A,B)                             PATCHL  2
C                                                                       PATCHL  3
C     COMPUTE INTEGRATION COEFFICIENTS FOR PATCH LOAD                   PATCHL  4
C                                                                       PATCHL  5
      DIMENSION P(12)                                                   PATCHL  6
      REAL N,NN,NNN,N4                                                  PATCHL  7
C                                                                       PATCHL  8
      E=A2-A1                                                           PATCHL  9
      EE=A2*A2-A1*A1                                                    PATCHL10
      EEE=A2**3-A1**3                                                   PATCHL11
      E4=A2**4-A1**4                                                    PATCHL12
C                                                                       PATCHL13
      N=B2-B1                                                           PATCHL14
      NN=B2*B2-B1*B1                                                    PATCHL15
      NNN=B2**3-B1**3                                                   PATCHL16
      N4=B2**4-B1**4                                                    PATCHL17
C                                                                       PATCHL18
      P(1)=E*N                                                          PATCHL19
      P(2)=EE*N/2.                                                      PATCHL20
      P(3)=E*NN/2.                                                      PATCHL21
      P(4)=EEE*N/3.                                                     PATCHL22
      P(5)=EE*NN/4.                                                     PATCHL23
      P(6)=E*NNN/3.                                                     PATCHL24
      P(7)=E4*N/4.                                                      PATCHL25
      P(8)=EEE*NN/6.                                                    PATCHL26
      P(9)=EE*NNN/6.                                                    PATCHL27
      P(10)=E*N4/4.                                                     PATCHL28
      P(11)=E4*NN/8.                                                    PATCHL29
      P(12)=EE*N4/8.                                                    PATCHL30
C                                                                       PATCHL31
      DO 10 I=1,12                                                      PATCHL32
   10 P(I)=P(I)*A*B                                                     PATCHL33
C                                                                       PATCHL34
      RETURN                                                            PATCHL35
      END                                                               PATCHL36
      OVERLAY  (ECCP,10,0)                                              OVERL8  2
      PROGRAM OVERL8                                                    OVERL8  3
C                                                                       OVERL8  4
C     THIS OVERLAY READS BEAM DATA AND ASSIGNS ELEMENT PROPERTIES       OVERL8  5
```

```
C                                                                       OVERL8  6
      COMMON /OVER8/ N1,N2,N3,N4,N5,N6,N7,N8,N9,N10,N11,N12,N13,N14,N15,OVERL8  7
     1N16,N17,N18,N19,N20,N21,N22,N23,N24,N25,N26,N27,N28,N29,N30       OVERL8  8
      COMMON /BDIM/ RON(48)                                             OVERL8  9
      COMMON /CB01/ NUMEL,NANA,NUMNP,NETA,NA1,NULAY,NSLAYR,NCNS         OVERL810
      COMMON /ICORES/ ICR(7),ICCRE                                      OVERL811
      COMMON /CB310/ NELX,NSMAT,NELY                                    OVERL812
      COMMON /CB2/ NBEAMX,NIX,NULAYB,NULAYR,NULAYE,NR,NRE               OVERL813
      COMMON /CB4/ IN,IO                                                OVERL814
      COMMON /CB300/ NPERBM,NREADB,KSIG,KIN,KC,KMAT,KPS,NOBM,NNN        OVERL815
      COMMON /SMX/ OLOAD,PMAX,SHEARM                                    OVERL816
      COMMON /BTCHK/ STRAMX(30)                                         OVERL817
      COMMON /CRWB/ CRB(10)                                             OVERL818
      COMMON A(1)                                                       OVFRL819
C                                                                       OVERL820
C                                                                       OVERL821
      IF (ICORE.NE.0) GO TO 10                                          OVERL822
      ICORE=LOCF(A(1))+1                                                OVERL823
      GO TO 20                                                          OVERL824
   10 CONTINUE                                                          OVERL825
      CALL BINF (NBEAMX,NIX,NULAYB,NUMNP,NR,NRE,NULAYR,NULAYE,NELX,NELY,OVERL826
     1NPERBM,NREADB,KIN,KC,KMAT,NOBM,A(N1),A(N2),A(N3),A(N4),A(N5),A(N6)OVERL827
     2,A(N7),A(N8),A(N9),A(N10),A(N11),A(N12),A(N13),A(N14),A(N15),A(N16OVERL828
     3),A(N17),A(N18),A(N19),A(N20),A(N21),A(N22),A(N23),A(N24),A(N25),AOVERL829
     4(N26),A(N27),A(N28),A(N29))                                       OVERL830
   20 CONTINUE                                                          OVERL831
      END                                                               OVERL832
      SUBROUTINE BINF (NBEAMX,NIX,NULAYB,NUMNP,NR,NRE,NULAYR,NULAYE,NELXBINF   2
     1,NELY,NPERBM,NREADB,KIN,KC,KMAT,NOBM,NPARX,NXL,NXR,GKEIX,NPIX,NPKXBINF   3
     2,SIBXXA,PA,PB,XSEG,YSEG,B,T,ITR,SIR,D,CGTB,PGTE,BE,TE,SE,ITE,CGTE,BINF   4
     3ASXLR,AILR,ZCRD,TSHEAR,ESX,ITYPE)                                 BINF   5
      COMMON /BDIM/ RON(6),ROM(6),EDOWN(6),STRAN(6),SIGO(6),FT(6),RONT(3BINF   6
     1),ROMT(3),EDOWNT(3),EDOWNR(3)                                     BINF   7
      COMMON /BTCHK/ STRAMX(6),STTEMX(6),STCEMX(6),NK(6),NH(6)          BINF   8
      COMMON /CRWB/ TCC,MBAR,TS,AE,NEL,ML,MLS,FSO,WBMAX,WC              BINF   9
      COMMON /SMX/ OLOAD,PMAX,SHEARM                                    BINF  10
      COMMON /CB4/ IN,IO                                                BINF  11
      DIMENSION NPARX(NUMNP), NXL(NUMNP), NXR(NUMNP), NPIX(NIX), NPKX(NIBINF  12
     1X), SIBXXA(NULAYB,NPERBM), ASXLR(NULAYB,NPERBM), AILR(NULAYB,NPERBBINF  13
     2M), ZCRD(NULAYB,NPERBM), TSHEAR(NULAYB,NPERBM), ITYPE(NULAYB,NPERBBINF  14
     3M), ESX(NULAYB,NBEAMX), D(NR), CGTB(NR), CGTE(NPERBM), PGTE(NPERBMBINF  15
     4), BE(NRE,NPERBM), TE(NRE,NPERBM), SE(NRE,NPERBM), ITE(NRE,NPERBM)BINF  16
     5, B(NRE,NR), T(NRE,NR), ITR(NRE,NR), SIR(NRE,NR), PA(NRE), PB(NRE)BINF  17
     6, GKEIX(NPERBM), XSEG(NELX), YSEG(NELY), NZ(2)                    BINF  19
      DIMENSION ESXX(6)                                                 BINF  19
      DIMENSION ETFIND(12), FTFIND(18), STFIND(10)                      BINF  20
      DIMENSION RY2(12), RY1(12), SR(12)                                BINF  21
      REAL ITE,ITR                                                      BINF  22
      DATA (ETFIND(I),I=1,12)/0.,3.,3.9,4.75,5.6,1000.,700.,700.,1250.,1BINF  23
     1800.,3000.,3000./                                                 BINF  24
      DATA (STFIND(I),I=1,10)/0.,3.,3.9,4.75,1000.,.0024,.0024,.0023,.00BINF  25
     122,.0022/                                                         BINF  26
      DATA (FTFIND(I),I=1,18)/0.,1.,2.,3.,4.,5.,6.,7.,1000.,.11,.11,.1,.BINF  27
     109,.09,.08,.08,.07,.07/                                           BINF  28
      DATA (RY1(I),I=1,12)/0.,0.5,0.6,0.7,0.8,1.0,0.25,0.25,1.05,2.15,3.BINF  29
     155,3.55/                                                          BINF  30
      DATA (RY2(I),I=1,12)/0.,0.5,0.6,0.7,0.8,1.0,1.4,1.4,2.73,4.45,6.57BINF  31
     15,6.575/                                                          BINF  32
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      DATA (SR(I),I=1,12)/0.,0.5,0.6,0.7,0.8,1.0,42.,42.,46.,53.,62.,62.BINF   33
     1/                                                                 BINF   34
C                                                                       BINF   35
C                                                                       BINF   36
      IF (NBEAMX.EQ.0) GO TO 1050                                       BINF   37
C                                                                       BINF   38
      REWIND 5                                                          BINF   39
      READ (5) XSEG,YSEG                                                BINF   40
      REWIND 4                                                          BINF   41
      REWIND 13                                                         BINF   42
      REWIND 14                                                         BINF   43
      REWIND 15                                                         BINF   44
      REWIND 27                                                         BINF   45
C                                                                       BINF   46
C     SET UP BEAM ELEMENT TOPOLOGY                                      BINF   47
C                                                                       BINF   48
      DO 10 I=1,NUMNP                                                   BINF   49
      NXL(I)=NBEAMX+1                                                   BINF   50
      NXR(I)=NBEAMX+1                                                   BINF   51
      NPARX(I)=0                                                        BINF   52
   10 CONTINUE                                                          BINF   53
C                                                                       BINF   54
   20 FORMAT (16I5)                                                     BINF   55
      DO 30 I=1,NOBM                                                    BINF   56
      READ (5) NSTART                                                   BINF   57
      READ (5) LB1,LB2,LB3                                              BINF   58
C                                                                       BINF   59
      DO 30 J=1,NELX                                                    BINF   60
      M=J+(I-1)*NELX                                                    BINF   61
      READ (5) LB1,LB2,LB3                                              BINF   62
      NPIX(M)=NSTART+J-1                                                BINF   63
      NPKX(M)=NSTART+J                                                  BINF   64
      NPARX(NSTART+J)=1                                                 BINF   65
      NPARX(NSTART+J-1)=1                                               BINF   66
      NXR(NPIX(M))=M                                                    BINF   67
      NXL(NPKX(M))=M                                                    BINF   68
   30 CONTINUE                                                          BINF   69
      I=NBEAMX+1                                                        BINF   70
      NPIX(I)=NUMNP+1                                                   BINF   71
      NPKX(I)=NUMNP+1                                                   BINF   72
      WRITE (IO,40)                                                     BINF   73
   40 FORMAT (1H0,//,20X,*BEAM ELEMENT ARRAY // X-AXIS*,//,5X,*ELEMENT NBINF   74
     1UMBER*,7X,1HI,14X,1HK,11X,*LENGTH (IN)*,//)                       BINF   75
C                                                                       BINF   76
      DO 50 I=1,NOBM                                                    BINF   77
      DO 50 J=1,NPERBM                                                  BINF   78
      N=J+(I-1)*NPERBM                                                  BINF   79
   50 WRITE (IO,60) N,NPIX(N),NPKX(N),XSEG(J)                           BINF   80
   60 FORMAT (6X,I5,10X,I5,10X,I5,5X,F10.2)                             BINF   81
C                                                                       BINF   82
C                                                                       BINF   83
      WRITE (IO,70)                                                     BINF   84
      WRITE (IO,80) (M,NPARX(M),NXL(M),NXR(M),M=1,NUMNP)                BINF   85
   70 FORMAT (///20X,30HBEAM ELEMENT TOPOLOGY //X-AXIS,///4X,11HNODAL POBINF   86
     1INT,8X,5HNPARX,11X,3HNXL,12X,3HNXR///)                            BINF   87
   80 FORMAT (6X,I5,10X,I5,10X,I5,10X,I5)                               BINF   88
C                                                                       BINF   89
C     READ MATERIAL PROPERTIES                                          BINF   90
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C                                                                       BINF  91
      READ (IN,20) KC,KMAT                                              BINF  92
      WRITE (IO,90) KC,KMAT                                             BINF  93
   90 FORMAT (//,5X,*NUMBER OF CONCRETE MATERIALS, KC              =*,I8,BINF  94
     1//,5X,*NUMBER OF CONCRETE PLUS STEEL MATERIALS, KMAT=*,I8,1X)     BINF  95
C                                                                       BINF  96
      IF (KC.GT.3) WRITE (IO,100)                                       BINF  97
  100 FORMAT (1H0,//,11X,*MAX NUMBER OF CONCRETE MATERIALS HAS BEEN EXCEBINF  98
     1EDED*,//)                                                         BINF  99
      IF (KMAT.GT.6) WRITE (IO,110)                                     BINF 100
  110 FORMAT (1H0,//,11X,*MAX NUMBER OF BEAM MATERIALS HAS BEEN EXCEEDEDBINF 101
     1*,//)                                                             BINF 102
      IF (KC.GT.3) STOP 10                                              BINF 103
      IF (KMAT.GT.6) STOP 10                                            BINF 104
C                                                                       BINF 105
      WRITE (IO,120)                                                    BINF 106
  120 FORMAT (1H0,//,20X,*BEAM- MATERIAL PROPERTIES*,//,6X,*MAT. NO.  STBINF 107
     1GY (KSI)    FT (KSI)    MODULUS (KSI)    ROM       RON       EDOWN BINF 108
     2(KSI)    STRAN (PERCENT)*,/)                                     BINF 109
C                                                                       BINF 110
C                                                                       BINF 111
      DO 180 J=1,KMAT                                                   BINF 112
      READ (IN,130) I,SIGO(I),FT(I),ESXX(I),ROM(I),RON(I),EDOWN(I),STRANBINF 113
     1(I)                                                               BINF 114
  130 FORMAT (I5,7F10.0)                                                BINF 115
      STRAN(I)=STRAN(I)/100.                                            BINF 116
      IF (I.GT.KC) GO TO 140                                            BINF 117
      IF (ESXX(I).EQ.0.) ESXX(I)=33.*(145.)**1.5*SQRT(SIGO(I)*1000.)/100BINF 118
     10.                                                                BINF 119
      IF (FT(I).EQ.0.) CALL FIND (FT(I),FTFIND,18,SIGO(I),SIGO(I))      BINF 120
      IF (STRAN(I).EQ.0.) CALL FIND (STRAN(I),STFIND,10,SIGO(I),1.0)    BINF 121
      IF (EDOWN(I).EQ.0.0) CALL FIND (EDOWN(I),ETFIND,12,SIGO(I),1.0)   BINF 122
      IF (RON(I).EQ.0.0) RON(I)=9.0                                     BINF 123
      IF (ROM(I).EQ.0.0) ROM(I)=SIGO(I)/(.002*ESXX(I))                  BINF 124
      STRAN(I)=STRAN(I)*100.                                            BINF 125
      GO TO 160                                                         BINF 126
  140 CONTINUE                                                          BINF 127
      IF (FT(I).EQ.0.) FT(I)=SIGO(I)                                    BINF 128
      IF (ESXX(I).EQ.0.) ESXX(I)=27000.                                 BINF 129
      IF (ROM(I).EQ.0.) ROM(I)=.67                                      BINF 130
      IF (RON(I).EQ.0.) RON(I)=25.                                      BINF 131
      IF (STRAN(I).EQ.0.) STRAN(I)=1.                                   BINF 132
      STRAN(I)=STRAN(I)*100.                                            BINF 133
  150 FORMAT (8F10.0)                                                   BINF 134
  160 WRITE (IO,170) I,SIGO(I),FT(I),ESXX(I),ROM(I),RON(I),EDOWN(I),STRABINF 135
     1N(I)                                                              BINF 136
  170 FORMAT (1H0,7X,I5,2X,F10.4,4X,F10.4,2X,F8.2,7X,F9.4,2X,F8.3,3X,F8.BINF 137
     12,6X,F9.5)                                                        BINF 138
C                                                                       BINF 139
      STRAN(I)=-STRAN(I)                                                BINF 140
      STRAN(I)=STRAN(I)/100.                                            BINF 141
  180 CONTINUE                                                          BINF 142
C                                                                       BINF 143
C     READ CONCRETE TENSILE PROPERTIES                                  BINF 144
C                                                                       BINF 145
      IF (KC.EQ.0) GO TO 230                                            BINF 146
      WRITE (IO,190)                                                    BINF 147
  190 FORMAT (1H0,//,20X,*BEAM- CONCRETE TENSILE PROPERTIES*,//,6X,*MAT.BINF 148
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     1 NO.          ROMT         RONT      EDOWNT (KSI)*,//)                    BINF 149
C                                                                               BINF 150
      DO 220 J=1,KC                                                             BINF 151
      READ (IN,130) I,ROMT(I),RONT(I),EDOWNT(I)                                 BINF 152
C                                                                               BINF 153
      IF (EDOWNT(I).EQ.0.) EDOWNT(I)=800.                                       BINF 154
      IF (RONT(I).EQ.0.) RONT(I)=9.                                             BINF 155
      IF (ROMT(I).EQ.0.) ROMT(I)=1.                                             BINF 156
      EDOWNR(I)=1.                                                              BINF 157
      WRITE (IO,200) I,ROMT(I),RONT(I),EDOWNT(I)                                BINF 158
  200 FORMAT (1H0,7X,I5,7X,F9.4,3X,F8.3,3X,F8.2)                                BINF 159
      IF (I.GT.KC) WRITE (IO,210) KC                                            BINF 160
  210 FORMAT (//,1H0,7X,*INCORRECT MATERIAL NUMBER*,/,8X,* MATERIAL NUMBBINF 161
     1ER MUST BE LESS THAN OR EQUAL TO *,I3,//)                                 BINF 162
      IF (I.GT.KC) STOP 10                                                      BINF 163
  220 CONTINUE                                                                  BINF 164
  230 CONTINUE                                                                  BINF 165
C                                                                               BINF 166
C     READ IN TERMINATION CHECKS FOR THE BEAM                                   BINF 167
C                                                                               BINF 168
      READ (IN,130) NC                                                          BINF 169
      WRITE (IO,240) NC                                                         BINF 170
  240 FORMAT (1H0,//,6X,*NUMBER OF CARDS TO SPECIFY TERMINATION CHECKS =BINF 171
     1 *,I2,/)                                                                  BINF 172
      IF (NC.GT.KMAT) WRITE (IO,250) KMAT                                       BINF 173
  250 FORMAT (//,1H0,*NUMBER OF TERMINATION CHECKS EXCEEDS *,I3,//)             BINF 174
      IF (NC.GT.KMAT) STOP 10                                                   BINF 175
C                                                                               BINF 176
      WRITE (IO,260)                                                            BINF 177
  260 FORMAT (1H0,/,21X,*TERMINATION CHECKS FOR THE BEAM LAYERS*,/,21X,*BINF 178
     1(STRESS IN KSI, STRAIN IN PERCENT)*,//,6X,*MAT. NO.  MAX STRAIN  MBINF 179
     2AX TENSILE  MAX COMP  NUMBER OF CRACKED    NUMBER OF*,/,31X,*STRESBINF 180
     3S     STRESS   OR YIELDED LAYERS  CRUSHED LAYERS*,//)                    BINF 181
C                                                                               BINF 182
      IF (NC.EQ.0) GO TO 280                                                    BINF 183
      READ (IN,270) (J,STRAMX(J),STTEMX(J),STCEMX(J),NK(J),NH(J),I=1,NC)BINF 184
  270 FORMAT (I5,3F10.0,2I5)                                                    BINF 185
  280 CONTINUE                                                                  BINF 186
C                                                                               BINF 187
C     PRINT OUT CHECKS AND SET UP DEFAULT VALUES                                BINF 188
C                                                                               BINF 189
      DO 300 J=1,KMAT                                                           BINF 190
C                                                                               BINF 191
      STRAMX(J)=STRAMX(J)/100.                                                  BINF 192
      IF (STRAMX(J).LT.0.0) STRAMX(J)=SIGO(J)/(ROM(J)*ESXX(J))                  BINF 193
C                                                                               BINF 194
      IF (STTEMX(J).LT.0.0.AND.J.GT.KC) STTEMX(J)=FT(J)                         BINF 195
      IF(STTEMX(J).LT.0.0.AND.J.LE.KC) STTEMX(J)=6.0*SQRT(SIGO(J)*1000.)BINF 196
     1  /1000.                                                                  BINF 197
C                                                                               BINF 198
      IF (STCEMX(J).LT.0.0.AND.J.LE.KC) STCEMX(J)=0.8*SIGO(J)                   BINF 199
      IF (STCEMX(J).LT.0.0) STCEMX(J)=SIGO(J)                                   BINF 200
C                                                                               BINF 201
      IF (NK(J).LT.0.AND.J.GT.KC) NK(J)=1                                       BINF 202
      IF(NK(J).LT.0.0.AND.J.LE.KC) NK(J)=1                                      BINF 203
C                                                                               BINF 204
      IF (NH(J).LT.0.AND.J.LE.KC) NH(J)=1                                       BINF 205
      IF (NH(J).LT.0.AND.J.GT.KC) NH(J)=0                                       BINF 206
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C                                                                       BINF 207
      STRAMX(J)=STRAMX(J)*100.                                          BINF 208
      WRITE (IO,290) J,STRAMX(J),STTEMX(J),STCEMX(J),NK(J),NH(J)        BINF 209
  290 FORMAT (1H ,7X,I5,4X,F8.3,4X,F8.3,4X,F8.3,8X,I5,11X,I5)           BINF 210
C                                                                       BINF 211
      STRAMX(J)=STRAMX(J)/100.                                          BINF 212
  300 CONTINUE                                                          BINF 213
C                                                                       BINF 214
C     READ IN SHEAR CHECK                                               BINF 215
C                                                                       BINF 216
      READ (IN,270) I,SHEARM                                            BINF 217
      IF (SHEARM.LT.0.0) SHEARM=2.0*0.85*SQRT(SIGO(I)*1000.)/1000.      BINF 218
      WRITE (IO,310) I,SHEARM                                           BINF 219
  310 FORMAT (1H0,//,6X,* MATERIAL TYPE USED IF SHEAR IS TO BE COMPUTED BINF 220
     1           = *,I8,/,6X,*MAX ALLOWABLE FLEXURAL SHEAR FOR THE BEAM BINF 221
     2 (KSI) = *,F8.3,/)                                                BINF 222
C                                                                       BINF 223
C     CRACK WIDTH DATA                                                  BINF 224
C                                                                       BINF 225
      READ (IN,130) MBAR,TCC,WBMAX                                      BINF 226
      IF (WBMAX.LE.0.0) WBMAX=0.004                                     BINF 227
      WRITE (IO,320) MBAR,TCC,WBMAX                                     BINF 228
  320 FORMAT (1H0,//,6X,*NUMBER OF RE-BARS AND STRANDS = *,5X,I3,//,6X,*BINF 229
     1CONCRETE COVER*,16X,*= *,F8.3,* (IN)*,//,6X,*MAX ALLOWABLE CRACK WBINF 230
     2IDTH*,5X,*= *,F8.5,* (IN)*,//)                                    BINF 231
      FSO=-999.0                                                        BINF 232
C                                                                       BINF 233
C     READ PROPERTY INPUT CODE                                          BINF 234
C                                                                       BINF 235
      READ (IN,700) NAME1,NAME2                                         BINF 236
      WRITE (IO,330) NAME1,NAME2                                        BINF 237
  330 FORMAT (1H0,//,6X,*BEAM INPUT IS BY *,A5,A5)                       BINF 238
C                                                                       BINF 239
C     READ ELEMENT LENGTHS                                              BINF 240
C                                                                       BINF 241
      REWIND 5                                                          BINF 242
      READ (5) XSEG,YSEG                                                BINF 243
C                                                                       BINF 244
C     READ ALL BEAMS TO BE INPUTTED                                     BINF 245
C                                                                       BINF 246
C                                                                       BINF 247
      NT=0                                                              BINF 248
      NL=1                                                              BINF 249
C                                                                       BINF 250
      DO 1020 IREADS=1,NREADE                                           BINF 251
C                                                                       BINF 252
      READ (IN,20) NB                                                   BINF 253
      WRITE (4) NB                                                      BINF 254
C                                                                       BINF 255
      NT=NT+NB                                                          BINF 256
C                                                                       BINF 257
      WRITE (IO,340) IREADS,NB,NL,NT                                    BINF 258
  340 FORMAT (1H0,//,6X,*READ NUMBER = *,I5,/,6X,*NUMBER OF DUPLICATE BEBINF 259
     1AMS = *,I5,/,6X,*STARTING BEAM =*,I5,*  END BEAM =*,I5,//)        BINF 260
C                                                                       BINF 261
      IF (NT.GT.NOBM) WRITE (IO,350) NT,NOBM                            BINF 262
  350 FORMAT (1H0,///,6X,*TOTAL NUMBER OF BEAMS TO BE GENERATED-*,I5,*- BINF 263
     1EXCEEDS THE NUMBER OF BEAMS INITIALLY COMPUTED-*,I5,///)          BINF 264
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C                                                                       BINF 265
      IF (NT.GT.NOBM) STOP                                              BINF 266
C                                                                       BINF 267
      IF (NAMEI.EQ.5HSECTI) GO TO 420                                   BINF 268
C                                                                       BINF 269
C     INITIALIZE                                                        BINF 270
C     READ IN PROPERTIES FOR BEAM ELEMENTS                              BINF 271
C                                                                       BINF 272
      DO 360 I=1,NULAYB                                                 BINF 273
      DO 360 J=1,NPERBM                                                 BINF 274
      SIBXXA(I,J)=0.                                                    BINF 275
      ITYPE(I,J)=0                                                      BINF 276
      ASXLR(I,J)=0.                                                     BINF 277
      AILR(I,J)=0.                                                      BINF 278
      ZCRD(I,J)=0.0                                                     BINF 279
      TSHEAR(I,J)=0.                                                    BINF 280
  360 CONTINUE                                                          BINF 281
C                                                                       BINF 282
C     READ ELEMENT PROPERTY CODE                                        BINF 283
C                                                                       BINF 284
      WRITE (IO,460)                                                    BINF 285
C                                                                       BINF 286
C     ASSIGN READ CODE                                                  BINF 287
C                                                                       BINF 288
  370 CONTINUE                                                          BINF 289
      READ (IN,380) NAME,NAME2,NAME3                                    BINF 290
  380 FORMAT (A2,A5,A3)                                                 BINF 291
      WRITE (IO,390) NAME,NAME2,NAME3                                   BINF 292
  390 FORMAT (1H0,5X,* CODE LETTERS = *,A2,A5,A3)                       BINF 293
C                                                                       BINF 294
      IF (NAME.EQ.2HEN) GO TO 420                                       BINF 295
      M=0                                                               BINF 296
      IF (NAME.EQ.2HST) M=1                                             BINF 297
      IF (NAME.EQ.2HTY) M=2                                             BINF 298
      IF (NAME.EQ.2HAR) M=3                                             BINF 299
      IF (NAME.EQ.2HIN) M=4                                             BINF 300
      IF (NAME.EQ.2HZC) M=5                                             BINF 301
      IF (NAME.EQ.2HWI) M=6                                             BINF 302
      IF (M.NE.0) GO TO 410                                             BINF 303
C                                                                       BINF 304
      WRITE (IO,460)                                                    BINF 305
      WRITE (IO,400)                                                    BINF 306
  400 FORMAT (1H0,5X,*NO TRANSLATION*,//)                               BINF 307
      STOP                                                              BINF 308
C                                                                       BINF 309
  410 CONTINUE                                                          BINF 310
C                                                                       BINF 311
C     READ SPECIFIC PROPERTY ARRAY                                      BINF 312
C                                                                       BINF 313
      I=NULAYB                                                          BINF 314
      J=NPERBM                                                          BINF 315
      IF (M.EQ.1) CALL READF (I,J,1,I,1,J,IN,KIN,SIBXXA)                BINF 316
      IF (M.EQ.2) CALL READI (I,J,1,I,1,J,IN,KIN,ITYPE)                 BINF 317
      IF (M.EQ.3) CALL READF (I,J,1,I,1,J,IN,KIN,ASXLR)                 BINF 318
      IF (M.EQ.4) CALL READF (I,J,1,I,1,J,IN,KIN,AILR)                  BINF 319
      IF (M.EQ.5) CALL READF (I,J,1,I,1,J,IN,KIN,ZCRD)                  BINF 320
      IF (M.EQ.6) CALL READF (I,J,1,I,1,J,IN,KIN,TSHEAR)                BINF 321
      GO TO 370                                                         BINF 322
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C                                                                       BINF 323
  420 CONTINUE                                                          BINF 324
C                                                                       BINF 325
C     WRITE BEAM END POINT BOUNDARY CONDITIONS TO TAPE                  BINF 326
C         FOR BOTH ELEMENTS AND SECTIONS INPUT OPTIONS                  BINF 327
C                                                                       BINF 328
      N=NPERBM+1                                                        BINF 329
      DO 430 J=NL,NT                                                    BINF 330
      READ (5) M                                                        BINF 331
      DO 430 I=1,N                                                      BINF 332
      READ (5) LB1,LB2,LB3                                              BINF 333
      IF (J.EQ.NT) WRITE (4) LB1,LB2,LB3                                BINF 334
  430 CONTINUE                                                          BINF 335
      NPS=0                                                             BINF 336
      IF (NAMEI.NE.5HSECTI) WRITE (4) NPS                               BINF 337
      IF (NAMEI.NE.5HSECTI) GO TO 910                                   BINF 338
C                                                                       BINF 339
C     ROUTINE FOR SECTIONS OPTION                                       BINF 340
C     INITIALIZE                                                        BINF 341
C                                                                       BINF 342
      DO 440 J=1,NR                                                     BINF 343
      CGTB(J)=0.                                                        BINF 344
      DO 440 I=1,NRE                                                    BINF 345
      B(I,J)=0.                                                         BINF 346
      T(I,J)=0.                                                         BINF 347
      ITR(I,J)=0.                                                       BINF 348
      SIR(I,J)=0.                                                       BINF 349
  440 CONTINUE                                                          BINF 350
C                                                                       BINF 351
C     READ NUMBER OF SECTIONS AT WHICH LAYER PROPERTIES WILL            BINF 352
C         BE DEFINED                                                    BINF 353
C                                                                       BINF 354
C                                                                       BINF 355
      READ (IN,20) NX                                                   BINF 356
      WRITE (IO,450) NX                                                 BINF 357
  450 FORMAT (1H0,//,6X,*NUMBER OF BEAM PROPERTY SECTIONS =*,I5)        BINF 358
C                                                                       BINF 359
C     READ X-LOCATION OF SECTIONS                                       BINF 360
C                                                                       BINF 361
      WRITE (IO,460)                                                    BINF 362
  460 FORMAT (1H )                                                      BINF 363
      READ (IN,150) (D(J),J=1,NX)                                       BINF 364
      WRITE (IO,470)                                                    BINF 365
  470 FORMAT (1H0,5X,*X-COORDINATE DISTANCES FROM START OF BEAM (IN)*)   BINF 366
      WRITE (IO,480) (D(J),J=1,NX)                                      BINF 367
  480 FORMAT ((1H0,5X,10(F8.3,2X,)))                                    BINF 368
C                                                                       BINF 369
      WRITE (IO,460)                                                    BINF 370
      READ (IN,150) (CGTB(J),J=1,NX)                                    BINF 371
      WRITE (IO,490)                                                    BINF 372
  490 FORMAT (1H0,5X,*Z-DISTANCES FROM REF. PLANE TO TOP OF BEAM (IN)*) BINF 373
      WRITE (IO,480) (CGTB(J),J=1,NX)                                   BINF 374
C                                                                       BINF 375
C     READ CONCRETE LAYER PROPERTIES                                    BINF 376
C                                                                       BINF 377
      WRITE (IO,460)                                                    BINF 378
  500 CONTINUE                                                          BINF 379
C                                                                       BINF 380
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C     READ PROPERTY CODE                                                BINF 381
C                                                                       BINF 382
      READ (IN,380) NAME,NAME2,NAME3                                    BINF 383
      WRITE (IO,390) NAME,NAME2,NAME3                                   BINF 384
C                                                                       BINF 385
C     ASSIGN READ CODE                                                  BINF 386
C                                                                       BINF 387
      IF (NAME.EQ.2HEN) GO TO 520                                       BINF 388
      M=5                                                               BINF 389
      IF (NAME.EQ.2HST) M=1                                             BINF 390
      IF (NAME.EQ.2HTY) M=2                                             BINF 391
      IF (NAME.EQ.2HWI) M=3                                             BINF 392
      IF (NAME.EQ.2HTH) M=4                                             BINF 393
      IF (M.NE.0) GO TO 510                                             BINF 394
C                                                                       BINF 395
      WRITE (IO,460)                                                    BINF 396
      WRITE (IO,400)                                                    BINF 397
      STOP                                                              BINF 398
C                                                                       BINF 399
  510 CONTINUE                                                          BINF 400
C                                                                       BINF 401
C     READ SPECIFIED LAYER PROPERTY ARRAY FOR THE SECTION               BINF 402
C                                                                       BINF 403
      IF (M.EQ.1) CALL READF (NRE,NR,1,NULAYR,1,NX,IN,1,SIR)            BINF 404
      IF (M.EQ.2) CALL READF (NRE,NR,1,NULAYR,1,NX,IN,1,ITR)            BINF 405
      IF (M.EQ.3) CALL READF (NRE,NR,1,NULAYR,1,NX,IN,1,B)              BINF 406
      IF (M.EQ.4) CALL READF (NRE,NR,1,NULAYR,1,NX,IN,1,T)              BINF 407
      IF (M.EQ.5) CALL BEAMT (NRE,NR,1,NULAYR,1,NX,IN,IO,1,NAME2,SIR,ITRBINF 408
     1,B,T,NAME3)                                                       BINF 409
      GO TO 500                                                         BINF 410
C                                                                       BINF 411
  520 CONTINUE                                                          BINF 412
C                                                                       BINF 413
C     PRINT SECTION PROPERTIES                                          BINF 414
C                                                                       BINF 415
      WRITE (IO,530)                                                    BINF 416
  530 FORMAT (1H0,//,6X,*SECTION PROPERTIES (SECTIONS ARE HORIZONTAL, LABINF 417
     1YERS ARE VERTICAL)*)                                              BINF 418
C                                                                       BINF 419
      WRITE (IO,460)                                                    BINF 420
      WRITE (IO,540)                                                    BINF 421
  540 FORMAT (1H0,5X,*ACTUAL LAYERS*,//,6X,*SECTION- WIDTH (IN) OF LAYERBINF 422
     1S*)                                                               BINF 423
      CALL WRITEF (NRE,NR,1,NULAYR,1,NX,IO,B)                           BINF 424
C                                                                       BINF 425
      WRITE (IO,550)                                                    BINF 426
  550 FORMAT (1H0,5X,*SECTION- THICKNESS (IN) OF LAYERS*)               BINF 427
      CALL WRITEF (NRE,NR,1,NULAYR,1,NX,IO,T)                           BINF 428
C                                                                       BINF 429
      WRITE (IO,560)                                                    BINF 430
  560 FORMAT (1H0,5X,*SECTION- INITIAL STRESS (KSI) OF LAYERS*)         BINF 431
      CALL WRITEF (NRE,NR,1,NULAYR,1,NX,IO,SIR)                         BINF 432
C                                                                       BINF 433
      WRITE (IO,570)                                                    BINF 434
  570 FORMAT (1H0,5X,*SECTION- MATERIAL TYPE FOR LAYERS*)               BINF 435
      CALL WRITEF (NRE,NR,1,NULAYR,1,NX,IO,ITR)                         BINF 436
C                                                                       BINF 437
C     READ EMBEDDED LAYER PROPERTIES                                    BINF 438
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C                                                                       BINF 439
      IF (NULAYE.EQ.0) GO TO 650                                        BINF 440
      IS=NULAYR+1                                                       BINF 441
      IE=NULAYR+NULAYE                                                  BINF 442
C                                                                       BINF 443
  580 CONTINUE                                                          BINF 444
C                                                                       BINF 445
C     READ PROPERTY CODE                                                BINF 446
C                                                                       BINF 447
      READ (IN,380) NAME,NAME2,NAME3                                    BINF 448
      WRITE (IO,390) NAME,NAME2,NAME3                                   BINF 449
C                                                                       BINF 450
C     ASSIGN READ CODE                                                  BINF 451
C                                                                       BINF 452
      IF (NAME.EQ.2HEN) GO TO 600                                       BINF 453
      M=0                                                               BINF 454
      IF (NAME.EQ.2HAR) M=1                                             BINF 455
      IF (NAME.EQ.2HZC) M=2                                             BINF 456
      IF (NAME.EQ.2HST) M=3                                             BINF 457
      IF (NAME.EQ.2HTY) M=4                                             BINF 458
      IF (M.NE.0) GO TO 590                                             BINF 459
C                                                                       BINF 460
      WRITE (IO,400)                                                    BINF 461
      STOP                                                              BINF 462
C                                                                       BINF 463
  590 CONTINUE                                                          BINF 464
C                                                                       BINF 465
C     READ SPECIFIED ARRAY                                              BINF 466
C                                                                       BINF 467
      IF (M.EQ.1) CALL READF (NRE,NR,IS,IE,1,NX,IN,1,B)                 BINF 468
      IF (M.EQ.2) CALL READF (NRE,NR,IS,IE,1,NX,IN,1,T)                 BINF 469
      IF (M.EQ.3) CALL READF (NRE,NR,IS,IE,1,NX,IN,1,SIR)               BINF 470
      IF (M.EQ.4) CALL READF (NRE,NR,IS,IE,1,NX,IN,1,ITR)               BINF 471
      GO TO 580                                                         BINF 472
C                                                                       BINF 473
  600 CONTINUE                                                          BINF 474
C                                                                       BINF 475
C     PRINT ARRAYS                                                      BINF 476
C                                                                       BINF 477
      WRITE (IO,460)                                                    BINF 478
      WRITE (IO,610)                                                    BINF 479
  610 FORMAT (1H0,5X,*EMBEDDED LAYERS*,//,6X,*SECTION- AREAS (SQ.IN) OF BINF 480
     1LAYERS*)                                                          BINF 481
      CALL WRITEF (NRE,NR,IS,IE,1,NX,IO,B)                              BINF 482
C                                                                       BINF 483
      WRITE (IO,620)                                                    BINF 484
  620 FORMAT (1H0,5X,*SECTION- CENTROIDAL DISTANCE (IN) OF LAYERS FROM TBINF 485
     1OP OF BEAM*)                                                      BINF 486
      CALL WRITEF (NRE,NR,IS,IE,1,NX,IO,T)                              BINF 487
C                                                                       BINF 488
      WRITE (IO,630)                                                    BINF 489
  630 FORMAT (1H0,5X,*SECTION- INITIAL STRESS (KSI) OF LAYERS*)         BINF 490
      CALL WRITEF (NRE,NR,IS,IE,1,NX,IO,SIR)                            BINF 491
C                                                                       BINF 492
      WRITE (IO,640)                                                    BINF 493
  640 FORMAT (1H0,5X,*SECTION- MATERIAL TYPE FOR LAYERS*)               BINF 494
      CALL WRITEF (NRE,NR,IS,IE,1,NX,IO,ITR)                            BINF 495
C                                                                       BINF 496
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  650 CONTINUE                                                          BINF 497
C                                                                       BINF 498
C     FIND ELEMENT PROPERTIES BY AVERAGING SECTION PROPERTIES ABOUT     BINF 499
C         THE CENTER OF THE ELEMENT.                                    BINF 500
C                                                                       BINF 501
      CALL AVGER (B,BE,D,NRE,NR,NRE,NPERBM,XSEG,NX,PA,PB)               BINF 502
      CALL AVGER (T,TE,D,NRE,NR,NRE,NPERBM,XSEG,NX,PA,PB)               BINF 503
      CALL AVGER (SIR,SE,D,NRE,NR,NRE,NPERBM,XSEG,NX,PA,PB)             BINF 504
      CALL AVGER (ITR,ITE,D,NRE,NR,NRE,NPERBM,XSEG,NX,PA,PB)            BINF 505
      CALL AVGER (CGTB,CGTE,D,1,NR,1,NPERBM,XSEG,NX,PA,PB)              BINF 506
C                                                                       BINF 507
C     COMPUTE LAYER PROPERTIES                                          BINF 508
C                                                                       BINF 509
      DO 660 J=1,NPERBM                                                 BINF 510
      ZCR=CGTE(J)                                                       BINF 511
      DO 660 I=1,NULAYR                                                 BINF 512
      TA=TE(I,J)                                                        BINF 513
      BA=BE(I,J)                                                        BINF 514
      ZCR=ZCR+TA/2.0                                                    BINF 515
      ASXLR(I,J)=TA*BA                                                  BINF 516
      ZCRD(I,J)=ZCR                                                     BINF 517
      AILR(I,J)=BA*TA*TA*TA/12.0                                        BINF 518
      SIBXXA(I,J)=SE(I,J)                                               BINF 519
      TSHEAR(I,J)=BA                                                    BINF 520
      ZCR=ZCR+TA/2.0                                                    BINF 521
      ITYPE(I,J)=ITE(I,J)+.5                                            BINF 522
  660 CONTINUE                                                          BINF 523
C                                                                       BINF 524
      IF (NULAYE.EQ.0) GO TO 680                                        BINF 525
      IS=NULAYR+1                                                       BINF 526
      IE=NULAYR+NULAYE                                                  BINF 527
C                                                                       BINF 528
      DO 670 J=1,NPERBM                                                 BINF 529
      ZCR=CGTE(J)                                                       BINF 530
      DO 670 I=IS,IE                                                    BINF 531
      AILR(I,J)=0.                                                      BINF 532
      SIBXXA(I,J)=SE(I,J)                                               BINF 533
      TSHEAR(I,J)=1.0                                                   BINF 534
      ZCRD(I,J)=TE(I,J)+ZCR                                             BINF 535
      ITYPE(I,J)=ITE(I,J)+.5                                            BINF 536
      ASXLR(I,J)=BE(I,J)                                                BINF 537
  670 CONTINUE                                                          BINF 538
C                                                                       BINF 539
  680 CONTINUE                                                          BINF 540
C                                                                       BINF 541
C     PRESTRESS INFORMATION                                             BINF 542
C                                                                       BINF 543
      READ (IN,20) NPS                                                  BINF 544
      WRITE (IO,690) NPS                                                BINF 545
  690 FORMAT (1H0,///,6X,*NUMBER OF PRESTRESS STRAND GROUPS = *,I3)     BINF 546
      IR=4                                                              BINF 547
      WRITE (IR) NPS                                                    BINF 548
      IF (NPS.EQ.0) GO TO 910                                           BINF 549
C                                                                       BINF 550
C     INITIALIZE END FORCES CAUSED BY PRESTRESS                         BINF 551
C                                                                       BINF 552
      VS=0.                                                             BINF 553
      AXS=0.                                                            BINF 554
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      AMS=0.                                                            BINF 555
      VE=0.                                                             BINF 556
      AXE=0.                                                            BINF 557
      AME=0.                                                            BINF 558
C                                                                       BINF 559
C     READ INFORMATION FOR ALL PRESTRESS GROUPS                         BINF 560
C                                                                       BINF 561
      DO 900 JJ=1,NPS                                                   BINF 562
C                                                                       BINF 563
      READ (IN,700) NAME,NAME2,APS,SPS,ITYPS                            BINF 564
  700 FORMAT (A5,A5,2F10.0,I5)                                          BINF 565
      WRITE (IO,710) JJ,NAME,NAME2,APS,SPS,ITYPS                        BINF 566
  710 FORMAT (1H0,5X,*PRESTRESS STRAND GROUP =*,I5,/,11X,*CLASS     = *,BINF 567
     1A5,A5,/,11X,*AREA      = *,F8.4,* SQ.IN*,/,11X,*STRESS    = *,F8.3BINF 568
     2,* KSI*,/,11X,*MAT. TYPE = *,I8,/)                                BINF 569
C                                                                       BINF 570
      READ (IN,720) CODEL,CODET                                         BINF 571
  720 FORMAT (2X,A3,A5)                                                 BINF 572
      WRITE (IO,730) CODEL,CODET                                        BINF 573
  730 FORMAT (1H0,5X,*COMPUTE PRESTRESS LOSS- *,A3,/,6X,*USING          BINF 574
     1       - *,A5)                                                    BINF 575
C                                                                       BINF 576
      EL=0.0                                                            BINF 577
C                                                                       BINF 578
C     CHECK IF PRESTRESS LOSS IS TO BE COMPUTED                         BINF 579
C                                                                       BINF 580
      IF (CODEL.NE.3HYES) GO TO 780                                     BINF 581
C                                                                       BINF 582
C     READ DATA TO COMPUTE THE LOSS                                     BINF 583
C                                                                       BINF 584
      READ (IN,150) AG,RIG,EG,DLMG,RNI                                  BINF 585
      WRITE (IO,740) AG,RIG,EG,DLMG,RNI                                 BINF 586
  740 FORMAT (1H0,5X,*PROPERTIES FOR BEAM CROSS-SECTION*,/,11X,*AREA    BINF 587
     1                    = *,F8.2,* SQ. IN*,/,11X,*INERTIA             BINF 588
     2          = *,F8.1,* IN4*,/,11X,*STRAND ECCENTRICITY FROM C.G. =BINF 589
     3 *,F8.4,* IN*,/,11X,*DEAD LOAD MOMENT ON SECTION   = *,F8.2,* IN-KBINF 590
     4IPS*,/,11X,*MODULAR RATIO OF STEEL/CONC.  = *,F8.4,/,1X)          BINF 591
C                                                                       BINF 592
      READ (IN,150) RIC,EC,DLMC                                         BINF 593
      WRITE (IO,750) RIC,EC,DLMC                                        BINF 594
  750 FORMAT (1H0,5X,*PROPERTIES FOR COMPOSITE CROSS-SECTION*,/,11X,*INEBINF 595
     1RTIA                       = *,F8.1,* IN4*,/,11X,*STRAND ECCENTRICBINF 596
     2ITY FROM C.G. = *,F8.4,* IN*,/,11X,*DEAD LOAD MOMENT ON SECTION   BINF 597
     3= *,F8.2,* IN-KIPS*,/,1X)                                         BINF 598
C                                                                       BINF 599
      READ (IN,150) FPU,TK1,TC                                          BINF 600
      WRITE (IO,760) FPU,TK1,TC                                         BINF 601
  760 FORMAT (1H0,5X,*ULTIMATE STRENGTH = *,F8.3,* KSI*,/6X,*TIME INTERVBINF 602
     1AL FROM TENSIONING OF STEEL TO TRANSFER = *,F8.1,* DAYS*,/,6X,*TIMBINF 603
     2E FROM TRANSFER = *,F8.1,* DAYS*,/,1X)                            BINF 604
C                                                                       BINF 605
      BETA=APS*(1.0/AG+EG*EG/RIG)                                       BINF 606
      BETA=1.0/BETA                                                     BINF 607
      FCL=DLMG*EG/RIG                                                   BINF 608
C                                                                       BINF 609
C     CHECK WHICH FORMULA TO USE                                        BINF 610
C                                                                       BINF 611
      IF (CODET.NE.5HBD201) GO TO 770                                   BINF 612
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C                                                                       BINF 613
C     USE METHOD PRESENTED IN PENNSYLVANIA DEPARTMENT OF TRANSPORTATION BINF 614
C         DESIGN STANDARDS BD201                                        BINF 615
C                                                                       BINF 616
      FC3=(SPS-BETA*FCL)/BETA                                           BINF 617
      EL=5.0*FC3                                                        BINF 618
      TL=6.0+16.*FC3+0.08*SPS                                           BINF 619
      SPS=SPS-TL+EL                                                     BINF 620
      GO TO 780                                                         BINF 621
C                                                                       BINF 622
C                                                                       BINF 623
C     USE METHOD PRESENTED IN - PRESTRESS LOSSES IN PRETENSIONED CONCRETBINF 624
C         STRUCTURAL MEMBERS - FRITZ LAB REPORT NO. 339.9 BY TI HUANG   BINF 625
C                                                                       BINF 626
  770 CONTINUE                                                          BINF 627
      IF (RIC.NE.0.0) FCL=FCL+DLMC*EC/RIC                               BINF 628
      R=SPS/FPU                                                         BINF 629
      CALL FIND (RYB,RY2,12,R,1.0)                                      BINF 630
      CALL FIND (RYA,RY1,12,R,1.0)                                      BINF 631
      CALL FIND (SRL,SR,12,R,1.0)                                       BINF 632
      REL=(RYB-RYA)*ALOG10(TK1)/ALOG10(20.)+RYA                         BINF 633
      REL=FPU*REL/100.                                                  BINF 634
      FC3=(SPS-REL)/(BETA+RNI-1.0)                                      BINF 635
      EL=RNI*FC3                                                        BINF 636
      RIL=REL+EL                                                        BINF 637
      RLD=2.*RNI*BETA*FCL/(BETA+RNI-1.0)                                BINF 638
      ECR=2.2*RNI*FC3                                                   BINF 639
      TL=SRL+ECR-RLD                                                    BINF 640
      PL=RIL+0.22*(TL-RIL)*ALOG10(TC)                                   BINF 641
      SPS=SPS-PL+EL                                                     BINF 642
C                                                                       BINF 643
  780 CONTINUE                                                          BINF 644
      WRITE (IO,790) SPS,EL                                             BINF 645
  790 FORMAT (1HO,//,6X,*PRESTRESS AFTER LOSSES (EXCEPT ELASTIC LOSS) = BINF 646
     1*F8.3,* KSI*,/,6X,*ESTIMATED ELASTIC LOSS                       = BINF 647
     2*,F8.3,* KSI*,/,1X)                                               BINF 648
C                                                                       BINF 649
C     CHECK SHAPE OF STRAND                                             BINF 650
C                                                                       BINF 651
      IF (NAME.EQ.5HPAPAB) GO TO 850                                    BINF 652
C                                                                       BINF 653
C     FOR STRAIGHT STRAND (STRAND MADE UP OF STRAIGHT LINE SEGMENTS)    BINF 654
C                                                                       BINF 655
      WRITE (IO,460)                                                    BINF 656
      READ (IN,20) NX                                                   BINF 657
      WRITE (IO,800) NX                                                 BINF 658
  800 FORMAT (1HO,5X,*NUMBER OF (X,Z) COORDINATE POINTS ARE *,I3)       BINF 659
C                                                                       BINF 660
      WRITE (IO,460)                                                    BINF 661
      READ (IN,150) (D(J),J=1,NX)                                       BINF 662
      WRITE (IO,810)                                                    BINF 663
  810 FORMAT (1HO,5X,*X - COORDINATES FROM START OF BEAM (IN)*)         BINF 664
      WRITE (IO,480) (D(J),J=1,NX)                                      BINF 665
C                                                                       BINF 666
      WRITE (IO,460)                                                    BINF 667
      READ (IN,150) (CGTB(J),J=1,NX)                                    BINF 668
      WRITE (IO,820)                                                    BINF 669
  820 FORMAT (1HO,5X,*Z - COORDINATES FROM TOP OF BEAM (IN)*)           BINF 670
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      WRITE (IO,480) (CGTB(J),J=1,NX)                                   BINF 671
C                                                                       BINF 672
      CALL AVGER (CGTB,PGTE,D,1,NR,1,NPERBM,XSEG,NX,PA,PB)              BINF 673
C                                                                       BINF 674
C     ASSIGN LAYER PROPERTIES                                           BINF 675
C                                                                       BINF 676
      J=NULAYR+NULAYE+JJ                                                BINF 677
      DO 830 I=1,NPERBM                                                 BINF 678
      ZCRD(J,I)=PGTE(I)+CGTE(I)                                         BINF 679
      ASXLR(J,I)=APS                                                    BINF 680
      AILR(J,I)=0.0                                                     BINF 681
      SIBXXA(J,I)=SPS                                                   BINF 682
      TSHEAR(J,I)=1.0                                                   BINF 683
      ITYPE(J,I)=ITYPS                                                  BINF 684
  830 CONTINUE                                                          BINF 685
C                                                                       BINF 686
C     COMPUTE PRESTRESS FORCES ON BEAM                                  BINF 687
C                                                                       BINF 688
C                                                                       BINF 689
C     CONCENTRATED END FORCES                                           BINF 690
C                                                                       BINF 691
      THETA=ATAN((CGTB(2)-CGTB(1))/D(2))                                BINF 692
      VS=+APS*SPS*SIN(THETA)+VS                                         BINF 693
      AX=+APS*SPS*COS(THETA)                                            BINF 694
      AXS=AXS+AX                                                        BINF 695
      AMS=+AX*(CGTB(1)+CGTE(1))+AMS                                     BINF 696
C                                                                       BINF 697
      THETA=ATAN((CGTB(NX)-CGTB(NX-1))/(D(NX)-D(NX-1)))                 BINF 698
      VE=VE-APS*SPS*SIN(THETA)                                          BINF 699
      AX=APS*SPS*COS(THETA)                                             BINF 700
      AXE=AXE-AX                                                        BINF 701
      AME=AME-AX*(CGTB(NX)+CGTE(NPERBM))                                BINF 702
C                                                                       BINF 703
C     VERTICAL FORCES ALONG BEAM                                        BINF 704
C                                                                       BINF 705
      N=NX-2                                                            BINF 706
      WRITE (IR) NAME,N                                                 BINF 707
      IF (NX.LE.2) GO TO 900                                            BINF 708
C                                                                       BINF 709
      N=NX-1                                                            BINF 710
      DO 840 I=2,N                                                      BINF 711
      THETA1=ATAN((CGTB(I)-CGTB(I-1))/(D(I)-D(I-1)))                    BINF 712
      THETA2=ATAN((CGTB(I+1)-CGTB(I))/(D(I+1)-D(I)))                    BINF 713
      THETA=THETA1-THETA2                                               BINF 714
      V=-APS*SPS*SIN(THETA)                                             BINF 715
C                                                                       BINF 716
      WRITE (IR) D(I),V                                                 BINF 717
  840 CONTINUE                                                          BINF 718
      GO TO 900                                                         BINF 719
C                                                                       BINF 720
C     FOR PARABOLIC DRAPPED STRAND                                      BINF 721
C                                                                       BINF 722
  850 CONTINUE                                                          BINF 723
      READ (IN,150) XA,YA,XB,YB,THETA                                   BINF 724
      IF (THETA.NE.0) WRITE (IO,860)                                    BINF 725
  860 FORMAT (1H0,//,5X,*INCORRECT DATA FOR PARABOLIC STRAND- SLOPE SHOUBINF 726
     1LD BE ZERO AT SECOND COORDINATE POINT*)                           BINF 727
      IF (THETA.NE.0) STOP 13                                           BINF 728
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C                                                                       BINF 729
      BP=(XA-XB)*(XA-XB)                                                BINF 730
      AP=(YA-YB)/BP                                                     BINF 731
      BP=-2.0*AP*XB                                                     BINF 732
      CP=AP*XB*XB+YB                                                    BINF 733
C                                                                       BINF 734
      WRITE (IO,460)                                                    BINF 735
      WRITE (IO,870) XA,YA,XB,YB,THETA,AP,BP,CP                         BINF 736
  870 FORMAT (1H0,5X,*FIRST COORDINATE (X,Z)  = (*,F8.3,*,*,F8.3,*) INCHBINF 737
     1ES*,/,6X,*SECOND COORDINATE (X,Z) = (*,F8.3,*,*,F8.3,*) INCHES*,/6BINF 738
     2X,*SLOPE AT SECOND POINT    = *,F8.3,/,6X,*PARABOLIC EQUATION IS Z BINF 739
     3= (*,E16.9,*) XX + (*,E16.9,*) X + (*,E16.9,*)*)                  BINF 740
C                                                                       BINF 741
C     END FORCES AND UNIFORM VERTICAL LOAD ALONG BEAM                   BINF 742
C                                                                       BINF 743
      XL=0.                                                             BINF 744
      DO 880 I=1,NPERBM                                                 BINF 745
  880 XL=XL+XSEG(I)                                                     BINF 746
C                                                                       BINF 747
      THETA=ATAN(BP)                                                    BINF 748
      VS=VS+APS*SPS*SIN(THETA)                                          BINF 749
      AX=APS*SPS*COS(THETA)                                             BINF 750
      AXS=AXS+AX                                                        BINF 751
      AMS=AMS+AX*(CP+CGTE(1))                                           BINF 752
C                                                                       BINF 753
      THETA=ATAN(2.0*AP*XL+BP)                                          BINF 754
      VE=VE-APS*SPS*SIN(THETA)                                          BINF 755
      AX=APS*SPS*COS(THETA)                                             BINF 756
      AXE=AXE-AX                                                        BINF 757
      AME=AME-AX*(AP*XL*XL+BP*XL+CP+CGTE(NPERBM))                       BINF 758
C                                                                       BINF 759
      W=APS*SPS*2.0*AP                                                  BINF 760
      I=3                                                               BINF 761
      WRITE (IR) NAME,I                                                 BINF 762
      WRITE (IR) W                                                      BINF 763
C                                                                       BINF 764
C     ASSIGN LAYER PROPERTIES                                           BINF 765
C                                                                       BINF 766
      XB=0.                                                             BINF 767
      XA=0.                                                             BINF 768
      J=NULAYR+NULAYE+JJ                                                BINF 769
      DO 890 I=1,NPERBM                                                 BINF 770
      XB=XB+XSEG(I)                                                     BINF 771
      ASXLR(J,I)=APS                                                    BINF 772
      SIBXXA(J,I)=SPS                                                   BINF 773
      AILR(J,I)=0.0                                                     BINF 774
      TSHEAR(J,I)=1.0                                                   BINF 775
      ITYPE(J,I)=ITYPS                                                  BINF 776
      ZCRD(J,I)=CGTE(I)+(XB**3-XA**3)*AP/3./(XB-XA)+(XB+XA)*BP/2.+CP    BINF 777
      XA=XB                                                             BINF 778
  890 CONTINUE                                                          BINF 779
C                                                                       BINF 780
C     GO TO A NEW PRESTRESS GROUP                                       BINF 781
C                                                                       BINF 782
  900 CONTINUE                                                          BINF 783
C                                                                       BINF 784
C     WRITE END FORCES TO TAPE                                          BINF 785
C                                                                       BINF 786
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      NAME=5HEND                                                        BINF 787
      I=3                                                               BINF 788
      WRITE (IR) NAME,I                                                 BINF 789
      WRITE (IR) VS,AXS,AMS                                             BINF 790
      WRITE (IR) VE,AXE,AME                                             BINF 791
  910 CONTINUE                                                          BINF 792
C                                                                       BINF 793
C     PRINT ELEMENT PROPERTY ARRAYS                                     BINF 794
C                                                                       BINF 795
      IS=NPERBM                                                         BINF 796
      IE=NULAYB                                                         BINF 797
C                                                                       BINF 798
      WRITE (IO,460)                                                    BINF 799
      WRITE (IO,920) IREADS                                             BINF 800
  920 FORMAT (1H0,5X,*READ NUMBER = *,I3,//,6X,*BEAM ELEMENT/LAYER PROPEBINF 801
     1RTIES (LAYERS VERTICAL, ELEMENTS HORIZONTAL)*)                    BINF 802
C                                                                       BINF 803
      WRITE (IO,460)                                                    BINF 804
      WRITE (IO,930)                                                    BINF 805
  930 FORMAT (1H0,5X,*ELEMENTS- INITIAL STRESS (KSI) IN LAYERS*)        BINF 806
      CALL WRITEF (IE,IS,1,IE,1,IS,IO,SIBXXA)                          BINF 807
C                                                                       BINF 808
      WRITE (IO,940)                                                    BINF 809
  940 FORMAT (1H0,5X,*ELEMENTS- MATERIAL TYPE FOR LAYERS*)              BINF 810
      CALL WRITEI (IE,IS,1,IE,1,IS,IO,ITYPE)                           BINF 811
C                                                                       BINF 812
      WRITE (IO,950)                                                    BINF 813
  950 FORMAT (1H0,5X,*ELEMENTS- AREAS (SQ.IN) OF LAYERS*)               BINF 814
      CALL WRITEF (IE,IS,1,IE,1,IS,IO,ASXLR)                           BINF 815
C                                                                       BINF 816
C                                                                       BINF 817
      WRITE (IO,960)                                                    BINF 818
  960 FORMAT (1H0,5X,*ELEMENTS- MOMENT OF INERTIA OF LAYERS*)           BINF 819
      CALL WRITEF (IE,IS,1,IE,1,IS,IO,AILR)                            BINF 820
C                                                                       BINF 821
      WRITE (IO,970)                                                    BINF 822
  970 FORMAT (1H0,5X,*ELEMENTS- CENTROIDAL DISTANCE (IN) OF LAYERS FROM BINF 823
     1REFERENCE PLANE*)                                                 BINF 824
      CALL WRITEF (IE,IS,1,IE,1,IS,IO,ZCRD)                            BINF 825
C                                                                       BINF 826
      WRITE (IO,980)                                                    BINF 827
  980 FORMAT (1H0,5X,*ELEMENTS- SHEAR THICKNESS (IN) OF LAYERS*)        BINF 828
      CALL WRITEF (IE,IS,1,IE,1,IS,IO,TSHEAR)                          BINF 829
C                                                                       BINF 830
C     WRITE ELEMENT PROPERTY ARRAYS TO TAPE                             BINF 831
C                                                                       BINF 832
      DO 1010 III=NL,NT                                                 BINF 833
C                                                                       BINF 834
      DO 1000 II=1,NPERBM                                               BINF 835
      J=II+(III-1)*NPERBM                                               BINF 836
      I=II                                                              BINF 837
C                                                                       BINF 838
      DO 990 N=1,NULAYB                                                 BINF 839
  990 ESX(N,J)=ESXX(ITYPE(N,I))                                         BINF 840
C                                                                       BINF 841
      GKEIX(I)=0.                                                       BINF 842
      WRITE (27) XSEG(I),GKEIX(I),NPIX(J),NPKX(J),(ITYPE(N,I),N=1,NULAYBBINF 843
     1),(ASXLR(N,I),N=1,NULAYB),(AILR(N,I),N=1,NULAYB),(ZCRD(N,I),N=1,NUBINF 844
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     2LAYB),(TSHEAR(N,I),N=1,NULAYB)                                    BINF 845
C                                                                       BINF 846
      WRITE (15) (SIBXXA(N,I),N=1,NULAYB)                               BINF 847
C                                                                       BINF 848
      DO 1000 JJ=1,2                                                    BINF 849
      I=II+JJ-2                                                         BINF 850
      IF (I.EQ.0.OR.I.GT.NPERBM) GO TO 1000                             BINF 851
      WRITE (14) XSEG(I),GKEIX(I),(ITYPE(N,I),N=1,NULAYB),(ASXLR(N,I),N=BINF 852
     11,NULAYB),(AILR(N,I),N=1,NULAYB),(ZCRD(N,I),N=1,NULAYB),(TSHEAR(N,BINF 853
     2I),N=1,NULAYB)                                                    BINF 854
 1000 CONTINUE                                                          BINF 855
C                                                                       BINF 856
      I=NPERBM                                                          BINF 857
      WRITE (14) XSEG(I),GKEIX(I),(ITYPE(N,I),N=1,NULAYB),(ASXLR(N,I),N=BINF 858
     11,NULAYB),(AILR(N,I),N=1,NULAYB),(ZCRD(N,I),N=1,NULAYB),(TSHEAR(N,BINF 859
     2I),N=1,NULAYB)                                                    BINF 860
C                                                                       BINF 861
 1010 CONTINUE                                                          BINF 862
      IF (NT.GE.NCBM) GO TO 1030                                        BINF 863
      NL=NT+1                                                           BINF 864
C                                                                       BINF 865
C     GO TO ANOTHER GROUP OF BEAMS                                      BINF 866
C                                                                       BINF 867
 1020 CONTINUE                                                          BINF 868
C                                                                       BINF 869
 1030 CONTINUE                                                          BINF 870
C                                                                       BINF 871
      DO 1040 M=1,NUMNP                                                 BINF 872
      N1=NXL(M)                                                         BINF 873
      N2=NXR(M)                                                         BINF 874
      WRITE (13) NPARX(M),N1,N2,NPIX(N1),NPKX(N2)                       BINF 875
 1040 CONTINUE                                                          BINF 876
C                                                                       BINF 877
      REWIND 33                                                         BINF 878
      WRITE (33) ESX                                                    BINF 879
C                                                                       BINF 880
 1050 CONTINUE                                                          BINF 881
      RETURN                                                            BINF 882
      END                                                               BINF 883
      SUBROUTINE BEAMT (NULAYB,NPERBM,IRS,IRE,ICS,ICE,IN,IO,KIN,NAME,S,KBEAMT   2
     1,B,T,NAME3)                                                       BEAMT   3
C                                                                       BEAMT   4
C     BEAM TABLES                                                       BEAMT   5
C                                                                       BEAMT   6
      REAL K                                                            BEAMT   7
      DIMENSION S(NULAYB,NPERBM), K(NULAYB,NPERBM), B(NULAYB,NPERBM), T(BEAMT   8
     1NULAYB,NPERBM)                                                    BEAMT   9
C                                                                       BEAMT  10
      WRITE (IO,10)                                                     BEAMT  11
   10 FORMAT (1H ,20X,*BEAM LAYERING WILL BE GENERATED*)                BEAMT  12
      ILOC=0                                                            BEAMT  13
      IF (NAME.EQ.5HSHO-1) ILOC=1                                       BEAMT  14
      IF (NAME.EQ.5HSHO-2) ILOC=2                                       BEAMT  15
      IF (NAME.EQ.5HSHO-3) ILOC=3                                       BEAMT  16
      IF (NAME.EQ.5HSHO-4) ILOC=4                                       BEAMT  17
      IF (NAME.EQ.5HSHO-5) ILOC=5                                       BEAMT  18
      IF (NAME.EQ.5HSHO-6) ILOC=6                                       BEAMT  19
      IF (NAME.EQ.5H18/30) ILOC=7                                       BEAMT  20
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      IF (NAME.EQ.5H20/30) ILOC=8                                       BEAMT 21
      IF (NAME.EQ.5H18/33) ILOC=9                                       BEAMT 22
      IF (NAME.EQ.5H20/33) ILOC=10                                      BEAMT 23
      IF (NAME.EQ.5H24/33) ILOC=11                                      BEAMT 24
      IF (NAME.EQ.5H26/33) ILOC=12                                      BEAMT 25
      IF (NAME.EQ.5H18/36) ILOC=13                                      BEAMT 26
      IF (NAME.EQ.5H20/36) ILOC=14                                      BEAMT 27
      IF (NAME.EQ.5H24/36) ILOC=15                                      BEAMT 28
      IF (NAME.EQ.5H26/36) ILOC=16                                      BEAMT 29
      IF (NAME.EQ.5H20/39) ILOC=17                                      BEAMT 30
      IF (NAME.EQ.5H24/42) ILOC=18                                      BEAMT 31
      IF (NAME.EQ.5H24/45) ILOC=19                                      BEAMT 32
      IF (NAME.EQ.5H24/48) ILOC=20                                      BEAMT 33
      IF (NAME.EQ.5H24/51) ILOC=21                                      BEAMT 34
      IF (NAME.EQ.5H24/54) ILOC=22                                      BEAMT 35
      IF (NAME.EQ.5H24/60) ILOC=23                                      BEAMT 36
      IF (NAME.EQ.5H26/60) ILOC=24                                      BEAMT 37
      IF (NAME.EQ.5H26/63) ILOC=25                                      BEAMT 38
C                                                                       BEAMT 39
      IF (ILOC.GT.0) GO TO 40                                           BEAMT 40
C                                                                       BEAMT 41
      WRITE (IO,20)                                                     BEAMT 42
   20 FORMAT (1H0)                                                      BEAMT 43
      WRITE (IO,30)                                                     BEAMT 44
   30 FORMAT (1H0,5X,*NO TRANSLATION*,//)                               BEAMT 45
      STOP                                                              BEAMT 46
C                                                                       BEAMT 47
   40 CONTINUE                                                          BEAMT 48
C                                                                       BEAMT 49
      IF (IRE.EQ.10) GO TO 60                                           BEAMT 50
C                                                                       BEAMT 51
      WRITE (IO,50) IRE                                                 BEAMT 52
   50 FORMAT (//,1H0,5X,*NUMBER OF CONCRETE LAYERS MUST EQUAL 10 INSTEADBEAMT 53
     1 OF *,I3,//)                                                      BEAMT 54
      STOP                                                              BEAMT 55
C                                                                       BEAMT 56
   60 CONTINUE                                                          BEAMT 57
      DO 70 I=IRS,IRE                                                   BEAMT 58
      DO 70 J=ICS,ICE                                                   BEAMT 59
      S(I,J)=0.                                                         BEAMT 60
   70 K(I,J)=1.                                                         BEAMT 61
      CALL BA (ILOC,B,T,IRS,IRE,ICS,ICE,NULAYB,NPERBM)                  BEAMT 62
C                                                                       BEAMT 63
      IF (NAME3.NE.3HH   ) RETURN                                       BEAMT 64
      DO 80 I=IRS,IRE                                                   BEAMT 65
      DO 80 J=ICS,ICE                                                   BEAMT 66
   80 B(I,J)=B(I,J)/2.                                                  BEAMT 67
C                                                                       BEAMT 68
      RETURN                                                            BEAMT 69
      END                                                               BEAMT 70
      SUBROUTINE BA (ILOC,B,T,IRS,IRE,ICS,ICE,NULAYB,NPERBM)            BA     2
C                                                                       BA     3
C     THIS SUBROUTINE SELECTS BEAM DIMENSIONS                           BA     4
C     THEN LAYER WIDTHS AND THICKNESSES                                 BA     5
C                                                                       BA     6
      DIMENSION B(NULAYB,NPERBM), T(NULAYB,NPERBM)                      BA     7
C                                                                       BA     8
      GO TO (10,20,30,40,50,60,70,80,90,100,110,120,130,140,150,160,170,BA     9
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     1180,190,200,210,220,230,240,250), ILOC                          BA     10
C                                                                     BA     11
   10 CONTINUE                                                        BA     12
C     TYPE 1                                                          BA     13
C                                                                     BA     14
      D1=4.                                                           BA     15
      D2=3.                                                           BA     16
      D3=11.                                                          BA     17
      D4=5.                                                           BA     18
      D5=5.                                                           BA     19
      B1=12.                                                          BA     20
      B2=16.                                                          BA     21
      B3=6.                                                           BA     22
      GO TO 260                                                       BA     23
C                                                                     BA     24
   20 CONTINUE                                                        BA     25
C     TYPE 2                                                          BA     26
C                                                                     BA     27
      D1=6.                                                           BA     28
      D2=3.                                                           BA     29
      D3=15.                                                          BA     30
      D4=6.                                                           BA     31
      D5=6.                                                           BA     32
      B1=12.                                                          BA     33
      B2=18.                                                          BA     34
      B3=6.                                                           BA     35
      GO TO 260                                                       BA     36
C                                                                     BA     37
   30 CONTINUE                                                        BA     38
C     TYPE 3                                                          BA     39
C                                                                     BA     40
      D1=7.                                                           BA     41
      D2=4.5                                                          BA     42
      D3=19.                                                          BA     43
      D4=7.5                                                          BA     44
      D5=7.                                                           BA     45
      B1=16.                                                          BA     46
      B2=22.                                                          BA     47
      B3=7.                                                           BA     48
      GO TO 260                                                       BA     49
C                                                                     BA     50
   40 CONTINUE                                                        BA     51
C     TYPE 4                                                          BA     52
C                                                                     BA     53
      D1=8.                                                           BA     54
      D2=6.                                                           BA     55
      D3=23.                                                          BA     56
      D4=9.                                                           BA     57
      D5=8.                                                           BA     58
      B1=20.                                                          BA     59
      B2=26.                                                          BA     60
      B3=8.                                                           BA     61
      GO TO 260                                                       BA     62
C                                                                     BA     63
   50 CONTINUE                                                        BA     64
C     TYPE 5                                                          BA     65
C                                                                     BA     66
      D1=5.                                                           BA     67
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      D2=3.                                                    BA     68
      D3=37.                                                   BA     69
      D4=10.                                                   BA     70
      D5=8.                                                    BA     71
      B1=42.                                                   BA     72
      B2=28.                                                   BA     73
      B3=8.                                                    BA     74
      GO TO 260                                                BA     75
C                                                              BA     76
   60 CONTINUE                                                 BA     77
C     TYPE 6                                                   BA     78
C                                                              BA     79
      D1=5.                                                    BA     80
      D2=3.                                                    BA     81
      D3=46.                                                   BA     82
      D4=10.                                                   BA     83
      D5=8.                                                    BA     84
      B1=42.                                                   BA     85
      B2=28.                                                   BA     86
      B3=8.                                                    BA     87
      GO TO 260                                                BA     88
C                                                              BA     89
   70 CONTINUE                                                 BA     90
C     18/30                                                    BA     91
C                                                              BA     92
      D1=3.                                                    BA     93
      D2=3.                                                    BA     94
      D3=12.                                                   BA     95
      D4=8.                                                    BA     96
      D5=4.                                                    BA     97
      B1=12.                                                   BA     98
      B2=18.                                                   BA     99
      B3=6.                                                    BA    100
      GO TO 260                                                BA    101
C                                                              BA    102
   80 CONTINUE                                                 BA    103
C     20/30                                                    BA    104
C                                                              BA    105
      D1=3.                                                    BA    106
      D2=3.                                                    BA    107
      D3=12.                                                   BA    108
      D4=8.                                                    BA    109
      D5=4.                                                    BA    110
      B1=14.                                                   BA    111
      B2=20.                                                   BA    112
      B3=8.                                                    BA    113
      GO TO 260                                                BA    114
C                                                              BA    115
   90 CONTINUE                                                 BA    116
C     18/33                                                    BA    117
C                                                              BA    118
      D1=4.                                                    BA    119
      D2=3.                                                    BA    120
      D3=12.                                                   BA    121
      D4=8.                                                    BA    122
      D5=6.                                                    BA    123
      B1=12.                                                   BA    124
      B2=18.                                                   BA    125
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      B3=6.                                                          BA   126
      GO TO 260                                                      BA   127
C                                                                    BA   128
  100 CONTINUE                                                       BA   129
C     20/33                                                          BA   130
C                                                                    BA   131
      D1=4.                                                          BA   132
      D2=3.                                                          BA   133
      D3=12.                                                         BA   134
      D4=8.                                                          BA   135
      D5=6.                                                          BA   136
      B1=14.                                                         BA   137
      B2=20.                                                         BA   138
      B3=8.                                                          BA   139
      GO TO 260                                                      BA   140
C                                                                    BA   141
  110 CONTINUE                                                       BA   142
C     24/33                                                          BA   143
C                                                                    BA   144
      D1=4.                                                          BA   145
      D2=3.                                                          BA   146
      D3=12.                                                         BA   147
      D4=8.                                                          BA   148
      D5=6.                                                          BA   149
      B1=18.                                                         BA   150
      B2=24.                                                         BA   151
      B3=12.                                                         BA   152
      GO TO 260                                                      BA   153
C                                                                    BA   154
  120 CONTINUE                                                       BA   155
C     26/33                                                          BA   156
C                                                                    BA   157
      D1=4.                                                          BA   158
      D2=3.                                                          BA   159
      D3=12.                                                         BA   160
      D4=8.                                                          BA   161
      D5=6.                                                          BA   162
      B1=20.                                                         BA   163
      B2=26.                                                         BA   164
      B3=14.                                                         BA   165
      GO TO 260                                                      BA   166
C                                                                    BA   167
  130 CONTINUE                                                       BA   168
C     18/36                                                          BA   169
C                                                                    BA   170
      D1=5.                                                          BA   171
      D2=3.                                                          BA   172
      D3=12.                                                         BA   173
      D4=8.                                                          BA   174
      D5=8.                                                          BA   175
      B1=12.                                                         BA   176
      B2=18.                                                         BA   177
      B3=6.                                                          BA   178
      GO TO 260                                                      BA   179
C                                                                    BA   180
  140 CONTINUE                                                       BA   181
C     20/36                                                          BA   182
C                                                                    BA   183
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      D1=5.                                                          BA   184
      D2=3.                                                          BA   185
      D3=12.                                                         BA   186
      D4=8.                                                          BA   187
      D5=8.                                                          BA   188
      31=14.                                                         BA   189
      B2=20.                                                         BA   190
      B3=8.                                                          BA   191
      GO TO 260                                                      BA   192
C                                                                    BA   193
  150 CONTINUE                                                       BA   194
C     24/36                                                          BA   195
C                                                                    BA   196
      D1=5.                                                          BA   197
      D2=3.                                                          BA   198
      D3=12.                                                         BA   199
      D4=8.                                                          BA   200
      D5=8.                                                          BA   201
      B1=18.                                                         BA   202
      B2=24.                                                         BA   203
      B3=12.                                                         BA   204
      GO TO 260                                                      BA   205
C                                                                    BA   206
  160 CONTINUE                                                       BA   207
C     26/36                                                          BA   208
C                                                                    BA   209
      D1=5.                                                          BA   210
      D2=3.                                                          BA   211
      D3=12.                                                         BA   212
      D4=8.                                                          BA   213
      D5=8.                                                          BA   214
      B1=20.                                                         BA   215
      B2=26.                                                         BA   216
      B3=14.                                                         BA   217
      GO TO 260                                                      BA   218
C                                                                    BA   219
  170 CONTINUE                                                       BA   220
C     20/39                                                          BA   221
C                                                                    BA   222
      D1=8.                                                          BA   223
      D2=3.                                                          BA   224
      D3=12.                                                         BA   225
      D4=8.                                                          BA   226
      D5=8.                                                          BA   227
      B1=14.                                                         BA   228
      B2=20.                                                         BA   229
      B3=8.                                                          BA   230
      GO TO 260                                                      BA   231
C                                                                    BA   232
  180 CONTINUE                                                       BA   233
C     24/42                                                          BA   234
C                                                                    BA   235
      D1=4.                                                          BA   236
      D2=4.                                                          BA   237
      D3=17.                                                         BA   238
      D4=10.                                                         BA   239
      D5=7.                                                          BA   240
      B1=18.                                                         BA   241
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      B2=24.                                                    BA  242
      B3=8.                                                     BA  243
      GO TO 260                                                 BA  244
C                                                               BA  245
  190 CONTINUE                                                  BA  246
C     24/45                                                     BA  247
C                                                               BA  248
      D1=7.                                                     BA  249
      D2=4.                                                     BA  250
      D3=17.                                                    BA  251
      D4=10.                                                    BA  252
      D5=7.                                                     BA  253
      B1=18.                                                    BA  254
      B2=24.                                                    BA  255
      B3=8.                                                     BA  256
      GO TO 260                                                 BA  257
C                                                               BA  258
  200 CONTINUE                                                  BA  259
C     24/48                                                     BA  260
C                                                               BA  261
      D1=8.                                                     BA  262
      D2=4.                                                     BA  263
      D3=17.                                                    BA  264
      D4=10.                                                    BA  265
      D5=9.                                                     BA  266
      B1=18.                                                    BA  267
      B2=24.                                                    BA  268
      B3=8.                                                     BA  269
      GO TO 260                                                 BA  270
C                                                               BA  271
  210 CONTINUE                                                  BA  272
C     24/51                                                     BA  273
C                                                               BA  274
      D1=11.                                                    BA  275
      D2=4.                                                     BA  276
      D3=17.                                                    BA  277
      D4=10.                                                    BA  278
      D5=9.                                                     BA  279
      B1=18.                                                    BA  280
      B2=24.                                                    BA  281
      B3=8.                                                     BA  282
      GO TO 260                                                 BA  283
C                                                               BA  284
  220 CONTINUE                                                  BA  285
C     24/54                                                     BA  286
C                                                               BA  287
      D1=14.                                                    BA  288
      D2=4.                                                     BA  289
      D3=17.                                                    BA  290
      D4=10.                                                    BA  291
      D5=9.                                                     BA  292
      B1=18.                                                    BA  293
      B2=24.                                                    BA  294
      B3=8.                                                     BA  295
      GO TO 260                                                 BA  296
C                                                               BA  297
  230 CONTINUE                                                  BA  298
C     24/60                                                     BA  299
```

```
C                                                                       BA    300
      D1=6.                                                             BA    301
      D2=6.                                                             BA    302
      D3=29.                                                            BA    303
      D4=10.                                                            BA    304
      D5=9.                                                             BA    305
      B1=24.                                                            BA    306
      B2=24.                                                            BA    307
      B3=8.                                                             BA    308
      GO TO 260                                                         BA    309
C                                                                       BA    310
  240 CONTINUE                                                          BA    311
C     26/60                                                             BA    312
C                                                                       BA    313
      D1=6.                                                             BA    314
      D2=6.                                                             BA    315
      D3=29.                                                            BA    316
      D4=10.                                                            BA    317
      D5=9.                                                             BA    318
      B1=26.                                                            BA    319
      B2=26.                                                            BA    320
      B3=10.                                                            BA    321
      GO TO 260                                                         BA    322
C                                                                       BA    323
  250 CONTINUE                                                          BA    324
C     26/63                                                             BA    325
C                                                                       BA    326
      D1=9.                                                             BA    327
      D2=3.                                                             BA    328
      D2=6.                                                             BA    329
      D3=29.                                                            BA    330
      D4=10.                                                            BA    331
      D5=9.                                                             BA    332
      B1=26.                                                            BA    333
      B2=26.                                                            BA    334
      B3=10.                                                            BA    335
C                                                                       BA    336
  260 CONTINUE                                                          BA    337
      I=IRS                                                             BA    338
      B(I,1)=B1                                                         BA    339
      I=I+1                                                             BA    340
      B(I,1) = B1                                                       BA    341
      I=I+1                                                             BA    342
      B(I,1)=(B1+B3)/2.                                                 BA    343
      I=I+1                                                             BA    344
      B(I,1)=B3                                                         BA    345
      I=I+1                                                             BA    346
      B(I,1)=B3                                                         BA    347
      I=I+1                                                             BA    348
      B(I,1)=B2/4.+0.75*B3                                              BA    349
      I=I+1                                                             BA    350
      B(I,1)=B3/4.+0.75*B2                                              BA    351
      I=I+1                                                             BA    352
      B(I,1)=B2                                                         BA    353
      I=I+1                                                             BA    354
      B(I,1)=B2                                                         BA    355
      I=I+1                                                             BA    356
      B(I,1) = B2                                                       BA    357
```

```
C                                                                       BA   358
      I=IRS                                                             BA   359
      T(I,1)=2.0                                                        BA   360
      I=I+1                                                             BA   361
      T(I,1) = D1-2.0                                                   BA   362
      I = I+1                                                           BA   363
      T(I,1)=D2                                                         BA   364
      I=I+1                                                             BA   365
      T(I,1)=D3/2.                                                      BA   366
      I=I+1                                                             BA   367
      T(I,1)=D3/2.                                                      BA   368
      I=I+1                                                             BA   369
      T(I,1)=D4/2.                                                      BA   370
      I=I+1                                                             BA   371
      T(I,1)=D4/2.                                                      BA   372
      I=I+1                                                             BA   373
      T(I,1)=D5/2.0-1.                                                  BA   374
      I=I+1                                                             BA   375
      T(I,1)=D5/2.0-1.                                                  BA   376
      I = I+1                                                           BA   377
      T(I,1) = 2.                                                       BA   378
C                                                                       BA   379
      DO 270 I=IRS,IRE                                                  BA   380
      DO 270 J=ICS,ICE                                                  BA   381
      B(I,J)=B(I,1)                                                     BA   382
  270 T(I,J)=T(I,1)                                                     BA   383
C                                                                       BA   384
      RETURN                                                            BA   385
      END                                                               BA   386
      SUBROUTINE FIND (A,B,NB,C,D)                                      FIND   2
      COMMON /CB4/ IN,IO                                                FIND   3
      DIMENSION B(NB)                                                   FIND   4
C                                                                       FIND   5
C     TABLE LOOK UP AND INTERPOLATION                                   FIND   6
C     C IS INDEPENDENT DATA                                             FIND   7
C     B IS TABLE                                                        FIND   8
C     D IS MULTIPICATION FACTOR                                         FIND   9
C     A IS RESULT                                                       FIND  10
C                                                                       FIND  11
      N=NB/2.                                                           FIND  12
      DO 10 I=1,N                                                       FIND  13
      IF (B(I).GT.C) GO TO 20                                           FIND  14
   10 CONTINUE                                                          FIND  15
   20 CONTINUE                                                          FIND  16
      A=(B(N+I)-B(N+I-1))/(B(I)-B(I-1))*(C-B(I-1))*D+B(N+I-1)*D         FIND  17
      RETURN                                                            FIND  18
      END                                                               FIND  19
      SUBROUTINE WRITEI (NULAYB,NPERBM,IRS,IRE,ICS,ICE,IO,A)            WRITEI  2
C                                                                       WRITEI  3
      INTEGER A                                                         WRITEI  4
      DIMENSION A(NULAYB,NPERBM)                                        WRITEI  5
C                                                                       WRITEI  6
      WRITE (IO,10)                                                     WRITEI  7
   10 FORMAT (1H )                                                      WRITEI  8
      DO 20 I=IRS,IRE                                                   WRITEI  9
   20 WRITE (IO,30) (A(I,J),J=ICS,ICE)                                  WRITEI 10
   30 FORMAT (1H0,5X,10I5,(/,11X,9I5))                                  WRITEI 11
      WRITE (IO,10)                                                     WRITEI 12
```

```
C                                                                       WRITEI13
      RETURN                                                            WRITEI14
      END                                                               WRITEI15
      SUBROUTINE WRITEF (NULAYB,NPERBM,IRS,IRE,ICS,ICE,IO,A)            WRITEF 2
C                                                                       WRITEF 3
      DIMENSION A(NULAYB,NPERBM)                                        WRITEF 4
C                                                                       WRITEF 5
      WRITE (IO,10)                                                     WRITEF 6
   10 FORMAT (1H )                                                      WRITEF 7
      DO 20 I=IRS,IRE                                                   WRITEF 8
   20 WRITE (IO,30) (A(I,J),J=ICS,ICE)                                  WRITEF 9
   30 FORMAT (1H0,5X,10F12.4,(/,18X,9F12.4))                            WRITEF10
      WRITE (IO,10)                                                     WRITEF11
C                                                                       WRITEF12
      RETURN                                                            WRITEF13
      END                                                               WRITEF14
      SUBROUTINE SUBST (PA,PD,NA,NR,L)                                  SUBST  2
C                                                                       SUBST  3
      DIMENSION PA(NA), PD(NA,NR)                                       SUBST  4
C                                                                       SUBST  5
      DO 10 I=1,NA                                                      SUBST  6
   10 PA(I)=PD(I,L)                                                     SUBST  7
C                                                                       SUBST  8
      RETURN                                                            SUBST  9
      END                                                               SUBST 10
      SUBROUTINE AVGER (PD,PE,D,NRE,NR,NEX,NPERBM,XSEG,NX,PA,PB)        AVGER  2
C                                                                       AVGER  3
C     THIS SUBROUTINE AVERAGES SECTION PROPERTIES TO GET ELEMENT        AVGER  4
C         PROPERTY                                                      AVGER  5
C                                                                       AVGER  6
      DIMENSION PD(NRE,NR), PE(NRE,NPERBM), D(NR), PA(NRE), PB(NRE), XSEAVGER  7
     1G(NPERBM)                                                         AVGER  8
C                                                                       AVGER  9
C     NODE I PROPERTIES IN VECTOR PA                                    AVGER 10
C     NODE J PROPERTIES IN VECTOR PB                                    AVGER 11
C                                                                       AVGER 12
C     FIRST ELEMENT- NODE I                                             AVGER 13
C                                                                       AVGER 14
      XA=0.0                                                            AVGER 15
      XB=0.0                                                            AVGER 16
      IF (XA.LE.D(1)) CALL SUBST (PA,PD,NRE,NR,1)                       AVGER 17
      IF (XA.GT.D(NX)) CALL SUBST (PA,PD,NRE,NR,NX)                     AVGER 18
C                                                                       AVGER 19
      DO 150 II=1,NPERBM                                                AVGER 20
C                                                                       AVGER 21
C     FIND PROP OF NODE J FOR ELEMENT II                                AVGER 22
C                                                                       AVGER 23
      XB=XB+XSEG(II)                                                    AVGER 24
      IF (XB.LE.D(1)) CALL SUBST (PB,PD,NRE,NR,1)                       AVGER 25
      IF (XB.GE.D(NX)) CALL SUBST (PB,PD,NRE,NR,NX)                     AVGER 26
      IF (NX.EQ.1) GO TO 40                                             AVGER 27
C                                                                       AVGER 28
C     CHECK IF NODE IS BETWEEN SPECIFIED PROP                           AVGER 29
C                                                                       AVGER 30
      NN=NX-1                                                           AVGER 31
      DO 10 J=1,NN                                                      AVGER 32
      IF (XB.GE.D(J).AND.XB.LE.D(J+1)) GO TO 20                         AVGER 33
   10 CONTINUE                                                          AVGER 34
```

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C                                                                       AVGER 35
      GO TO 40                                                          AVGER 36
C                                                                       AVGER 37
   20 CONTINUE                                                          AVGER 38
C                                                                       AVGER 39
C     NODE IS BETWEEN J AND J+1 SECTIONS                                AVGER 40
C     FIND AVERAGE PROP                                                 AVGER 41
C                                                                       AVGER 42
      A=(XB-D(J))/(D(J)-D(J+1))                                         AVGER 43
      DO 30 I=1,NRE                                                     AVGER 44
   30 PB(I)=A*(PD(I,J)-PD(I,J+1))+PD(I,J)                               AVGER 45
C                                                                       AVGER 46
   40 CONTINUE                                                          AVGER 47
      IE=0                                                              AVGER 48
      IS=0                                                              AVGER 49
C                                                                       AVGER 50
C     FIND SECTIONS THAT ARE IN BETWEEN NODES I AND J OF ELEMENT II     AVGER 51
C                                                                       AVGER 52
      DO 60 J=1,NX                                                      AVGER 53
      IF (IS.NE.0) GO TO 50                                             AVGER 54
      A=D(J)                                                            AVGER 55
      IF (A.GT.XA.AND.A.LT.XB) IS=J                                     AVGER 56
   50 CONTINUE                                                          AVGER 57
      IF (IE.NE.0) GO TO 60                                             AVGER 58
      A=D(NX-J+1)                                                       AVGER 59
      IF (A.GT.XA.AND.A.LT.XB) IE=NX-J+1                                AVGER 60
   60 CONTINUE                                                          AVGER 61
C                                                                       AVGER 62
      IF (IS.NE.0) GO TO 80                                             AVGER 63
C                                                                       AVGER 64
C     THERE ARE NO SECTIONS BETWEEN NODES                               AVGER 65
C                                                                       AVGER 66
      DO 70 I=1,NRE                                                     AVGER 67
   70 PE(I,II)=(PA(I)+PB(I))/2.0                                        AVGER 68
      GO TO 130                                                         AVGER 69
C                                                                       AVGER 70
   80 CONTINUE                                                          AVGER 71
C                                                                       AVGER 72
C     INITIALIZE ELEMENT PROPERTY MATRIX                                AVGER 73
C                                                                       AVGER 74
      DO 90 I=1,NRE                                                     AVGER 75
   90 PE(I,II)=0.                                                       AVGER 76
C                                                                       AVGER 77
      IF (IS.EQ.IE) GO TO 110                                           AVGER 78
C                                                                       AVGER 79
C     STARTING SECTION IS IS                                            AVGER 80
C     END SECTION IS IE                                                 AVGER 81
C     AVERAGE SECTIONS BETWEEN NODE POINTS                              AVGER 82
C                                                                       AVGER 83
      IE=IE-1                                                           AVGER 84
      DO 100 J=IS,IE                                                    AVGER 85
      A=(D(J+1)-D(J))/2.0                                               AVGER 86
      DO 100 I=1,NRE                                                    AVGER 87
  100 PE(I,II)=A*(PD(I,J+1)+PD(I,J))+PE(I,II)                           AVGER 88
      IE=IE+1                                                           AVGER 89
C                                                                       AVGER 90
C     ADD IN THE END PORTIONS                                           AVGER 91
C                                                                       AVGER 92
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  110 CONTINUE                                                          AVGER 93
      C=XSEG(II)                                                        AVGER 94
      A=(D(IS)-XA)/2.0/C                                                AVGER 95
      B=(XB-D(IE))/2.0/C                                                AVGER 96
C                                                                       AVGER 97
      DO 120 I=1,NRE                                                    AVGER 98
      PE(I,II)=A*(PD(I,IS)+PA(I))+B*(PD(I,IE)+PB(I))+PE(I,II)/C         AVGER 99
  120 CONTINUE                                                          AVGER100
C                                                                       AVGER101
  130 CONTINUE                                                          AVGER102
C                                                                       AVGER103
C     SET NODE I EQUAL TO NODE J                                        AVGER104
C                                                                       AVGER105
      XA=XB                                                             AVGER106
      DO 140 I=1,NRE                                                    AVGER107
  140 PA(I)=PB(I)                                                       AVGER108
C                                                                       AVGER109
C     GO TO NEXT ELEMENT                                                AVGER110
C                                                                       AVGER111
  150 CONTINUE                                                          AVGER112
      RETURN                                                            AVGER113
      END                                                               AVGER114
      SUBROUTINE READF (NULAYB,NPERBM,IRS,IRE,ICS,ICE,IN,KIN,A)         READF  2
C                                                                       READF  3
      DIMENSION A(NULAYB,NPERBM)                                        READF  4
C                                                                       READF  5
      DO 30 I=IRS,IRE                                                   READF  6
      NC=ICS                                                            READF  7
      IF (KIN.EQ.1) NC=ICE                                              READF  8
      READ (IN,10) (A(I,J),J=ICS,NC)                                    READF  9
   10 FORMAT (8F10.0)                                                   READF 10
      IF (KIN.EQ.1) GO TO 30                                            READF 11
C                                                                       READF 12
      DO 20 J=ICS,ICE                                                   READF 13
   20 A(I,J)=A(I,ICS)                                                   READF 14
C                                                                       READF 15
   30 CONTINUE                                                          READF 16
      RETURN                                                            READF 17
      END                                                               READF 18
      SUBROUTINE READI (NULAYB,NPERBM,IRS,IRE,ICS,ICE,IN,KIN,A)         READI  2
      INTEGER A                                                         READI  3
      DIMENSION A(NULAYB,NPERBM)                                        READI  4
C                                                                       READI  5
      DO 30 I=IRS,IRE                                                   READI  6
      NC=ICS                                                            READI  7
      IF (KIN.EQ.1) NC=ICE                                              READI  8
      READ (IN,10) (A(I,J),J=ICS,NC)                                    READI  9
   10 FORMAT (16I5)                                                     READI 10
      IF (KIN.EQ.1) GO TO 30                                            READI 11
C                                                                       READI 12
      DO 20 J=ICS,ICE                                                   READI 13
   20 A(I,J)=A(I,ICS)                                                   READI 14
C                                                                       READI 15
   30 CONTINUE                                                          READI 16
      RETURN                                                            READI 17
      END                                                               READI 18
      OVERLAY  (ECCP,2,0)                                               OVERL2 2
      PROGRAM OVERL2                                                    OVERL2 3
```

```
C                                                                       OVERL2  4
C     THIS OVERLAY FORMULATES STIFFNESS MATRIX                          OVERL2  5
C                                                                       OVERL2  6
      COMMON /CBS301/ COUPLE                                            OVERL2  7
      COMMON /PROPC/ V(11)                                              OVERL2  8
      COMMON /COMPLT/ ICMPLT                                            OVERL2  9
      COMMON /TUOO/ TUO(8,12)                                           OVERL210
      COMMON /C801/ NUMEL,NANA,NUMNP,NETA,NA1,NULAY,NSLAYR,NCNS         OVERL211
      COMMON /CB2/ NBEAMX,NIX,NULAYB                                    OVERL212
      COMMON /CB3/ LWIDTH,NITA,NPSEGM                                   OVERL213
      COMMON /C8309/ FTOL,CTOL                                          OVERL214
      COMMON /CB310/ NELX,NSMAT                                         OVERL215
      COMMON /BDIM/ RON(48)                                             OVERL216
      COMMON /PDIM/ PDT(70)                                             OVERL217
      COMMON /CB4/ IN,IO                                                OVERL218
      COMMON /C8300/ ISPACE(4),KC,KMAT                                  OVERL219
      COMMON /ICORES/ ICR(1),ICCRE                                      OVERL220
      COMMON /OVER2/ N1,N2,N3,N4,N5,N6,N7,N8,N9,N10,N11,N12,N13,N14,N15,OVERL221
     1N16,N17,N18,N19,N20,N21,N22                                       OVERL222
      COMMON A(1)                                                       OVERL223
C                                                                       OVERL224
C                                                                       OVERL225
      IF (ICORE.NE.0) GO TO 10                                          OVERL226
      ICORE=LOCF(A(1))+1                                                OVERL227
      GO TO 20                                                          OVERL228
   10 CONTINUE                                                          OVERL229
      NA5=NA1+LWIDTH-1                                                  OVERL230
      LAMA=5*NPSEGM                                                     OVERL231
      CALL PBS (NUMEL,NUMNP,NA1,NULAY,NSLAYR,NCNS,LAMA,LWIDTH,NA5,NULAYBOVERL232
     1,NBEAMX,NANA,NPSEGM,NIX,KC,KMAT,A(N1),A(N2),A(N3),A(N4),A(N5),A(N6OVERL233
     2),A(N7),A(N8),A(N9),A(N10),A(N11),A(N12),A(N13),A(N14),A(N15),A(N1OVERL234
     36),A(N17),A(N18),A(N19),A(N20),A(N21))                            OVERL235
   20 CONTINUE                                                          OVERL236
      END                                                               OVERL237
      SUBROUTINE PBS (NUMEL,NUMNP,NA1,NULAY,NSLAYR,NCNS,LAMA,LWIDTH,NA5,PBS    2
     1NULAYB,NBEAMX,NANA,NPSEGM,NIX,KC,KMAT,FORCE,LILA,AS1,AF,AS,SIGXXO,PBS    3
     2SIGYYO,SIGXYO,SXXOT,SYYOT,SXYOT,ALL,OVK,SIBXXA,SIBXXC,ASXLR,AILR,ZPBS    4
     3CRD,TSHEAR,ITYPE,ESX)                                             PBS    5
C                                                                       PBS    6
C     THIS SUBROUTINE FORMULATES GLOBAL STIFFNESS MATRIX                PBS    7
C                                                                       PBS    8
      COMMON /PDIM/ PDT(15),PZC(15),SEMOD(4),SIGMAP(4),SPRON(4),SPROM(4)PBS    9
     1,NSTYPE(6),SDT(6),SZC(6),SPHI(6)                                  PBS   10
      COMMON /BDIM/ RON(6),ROM(6),EDOWN(6),STRAN(6),SIGO(6),FT(6),RONT(3PBS   11
     1),ROMT(3),EDOWNT(3),EDOWNR(3)                                     PBS   12
      COMMON /CBS301/ COUPLE                                            PBS   13
      COMMON /C8309/ FTOL,CTOL                                          PBS   14
      COMMON /CB310/ NELX,NSMAT                                         PBS   15
      COMMON /TUOO/ TUO(8,12)                                           PBS   16
      COMMON /C809/ S1,S2,S3,S4                                         PBS   17
      COMMON /CB19/ BBS1,BBS2                                           PBS   18
      DIMENSION FORCE(NA1), LILA(NA1), AS1(NUMEL,NCNS), AF(NUMEL,NULAY),PBS   19
     1 AS(NUMEL,NULAY), SIGXXO(NCNS), SIGYYO(NCNS), SIGXYO(NCNS), SXXOT(PBS   20
     2NCNS), SYYOT(NCNS), SXYOT(NCNS), ALL(LWIDTH,LAMA), OVK(5,NA5), SIBPBS   21
     3XXA(NULAYB), SIBXXC(NULAYB), ASXLR(NULAYB), AILR(NULAYB), ZCRD(NULPBS   22
     4AYB), TSHEAR(NULAYB), ITYPE(NULAYB), ESX(NULAYB,NBEAMX), NZ(4)    PBS   23
      DIMENSION S1(4,5,5), S2(4,5,5), S3(4,5,5), S4(4,5,5), BBS1(2,5,5),PBS   24
     1 BBS2(2,5,5), NL(2)                                               PBS   25
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      DIMENSION MM(4,4)                                                 PBS   26
C                                                                       PBS   27
C                                                                       PBS   28
      REWIND 11                                                         PBS   29
      REWIND 12                                                         PBS   30
      REWIND 20                                                         PBS   31
      REWIND 22                                                         PBS   32
      REWIND 13                                                         PBS   33
      REWIND 14                                                         PBS   34
      REWIND 16                                                         PBS   35
      REWIND 24                                                         PBS   36
      REWIND 29                                                         PBS   37
      REWIND 31                                                         PBS   38
      REWIND 33                                                         PBS   39
      READ (29) FORCE,LILA                                              PBS   40
      READ (31) AS1,AF,AS                                               PBS   41
      READ (33) ESX                                                     PBS   42
C                                                                       PBS   43
      COMET=1.0E30                                                      PBS   44
      K=0                                                               PBS   45
      REWIND 3                                                          PBS   46
      ISEGM=NUMNP/NPSEGM                                                PBS   47
      KOUNT=0                                                           PBS   48
C                                                                       PBS   49
C     FIND NUMBER OF NODE POINTS IN EQUATION BLOCK                      PBS   50
C                                                                       PBS   51
      GO TO 20                                                          PBS   52
   10 IF (KLX2.EQ.NUMNP) GO TO 130                                      PBS   53
      KLX1=1+KOUNT*NPSEGM                                               PBS   54
      KLX2=NUMNP                                                        PBS   55
      GO TO 30                                                          PBS   56
   20 IF (KOUNT.GE.ISEGM) GO TO 10                                      PBS   57
      KLX1=1+KOUNT*NPSEGM                                               PBS   58
      KLX2=KLX1+NPSEGM-1                                                PBS   59
C                                                                       PBS   60
C     INITIALIZE                                                        PBS   61
C                                                                       PBS   62
   30 DO 40 I=1,LWIDTH                                                  PBS   63
      DO 40 J=1,LAMA                                                    PBS   64
   40 ALL(I,J)=0.                                                       PBS   65
      KJ=0                                                              PBS   66
C                                                                       PBS   67
C     FORMULATE A PORTION OF THE STIFFNESS MATRIX                       PBS   68
C                                                                       PBS   69
      DO 120 M=KLX1,KLX2                                                PBS   70
      KJ=KJ+5                                                           PBS   71
      K=K+5                                                             PBS   72
C                                                                       PBS   73
C     INITIALIZE                                                        PBS   74
C                                                                       PBS   75
      DO 50 I=1,5                                                       PBS   76
      DO 50 J=1,NA5                                                     PBS   77
      OVK(I,J)=0.                                                       PBS   78
   50 CONTINUE                                                          PBS   79
C                                                                       PBS   80
C     CONTRIBUTION OF PLATE ELEMENTS.                                   PBS   81
C                                                                       PBS   82
      READ (11) NZ(1),NZ(2),NZ(3),NZ(4),JN1,KN1,LN1,IN2,JN2,LN2,IN3,JN3,PBS   83
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     1KN3,IN4,KN4,LN4                                                   PBS   84
C                                                                       PBS   85
C      ASSIGN NODAL POINTS FOR THE 4 ELEMENTS SURROUNDING NODE M        PBS   86
C      I-J-K-L SEQUENCE                                                 PBS   87
C                                                                       PBS   88
C      FOR NZ=1                                                         PBS   89
       MM(1,1)=M                                                        PBS   90
       MM(1,2)=JN1                                                      PBS   91
       MM(1,3)=KN1                                                      PBS   92
       MM(1,4)=LN1                                                      PBS   93
C      FOR NZ=2                                                         PBS   94
       MM(2,1)=IN2                                                      PBS   95
       MM(2,2)=JN2                                                      PBS   96
       MM(2,3)=M                                                        PBS   97
       MM(2,4)=LN2                                                      PBS   98
C      FOR NZ=3                                                         PBS   99
       MM(3,1)=IN3                                                      PBS  100
       MM(3,2)=JN3                                                      PBS  101
       MM(3,3)=KN3                                                      PBS  102
       MM(3,4)=M                                                        PBS  103
C      FOR NZ=4                                                         PBS  104
       MM(4,1)=IN4                                                      PBS  105
       MM(4,2)=M                                                        PBS  106
       MM(4,3)=KN4                                                      PBS  107
       MM(4,4)=LN4                                                      PBS  108
C                                                                       PBS  109
C                                                                       PBS  110
       CALL ELSTMA (NCNS,NANA,NULAY,NUMNP,NUMEL,NSLAYR,NSMAT,M,NZ,MM,LILAPBS  111
      1,NA1,PZC,PDT,SZC,SDT,SXXOT,SYYOT,SXYOT,SIGXXO,SIGYYO,SIGXYO,AS1,AFPBS  112
      2,AS,SPHI,NSTYPE,SPROM,SPRON,SEMOD,SIGMAP)                        PBS  113
C                                                                       PBS  114
C      FIND MATRIX LOCATIONS                                            PBS  115
C                                                                       PBS  116
       I=1                                                              PBS  117
       IP=5*M-4                                                         PBS  118
       JN1=5*JN1-4                                                      PBS  119
       KN1=5*KN1-4                                                      PBS  120
       LN1=5*LN1-4                                                      PBS  121
       IN2=5*IN2-4                                                      PBS  122
       JN2=5*JN2-4                                                      PBS  123
       LN2=5*LN2-4                                                      PBS  124
       IN3=5*IN3-4                                                      PBS  125
       JN3=5*JN3-4                                                      PBS  126
       KN3=5*KN3-4                                                      PBS  127
       IN4=5*IN4-4                                                      PBS  128
       KN4=5*KN4-4                                                      PBS  129
       LN4=5*LN4-4                                                      PBS  130
C                                                                       PBS  131
C      STORAGE IN AUXILIARY ARRAY OVK(I,J)                              PBS  132
C                                                                       PBS  133
       DO 60 II=1,5                                                     PBS  134
       DO 60 JJ=1,5                                                     PBS  135
       KZ=II-1                                                          PBS  136
       LZ=JJ-1                                                          PBS  137
       OVK(I+KZ,IP+LZ)=S1(1,II,JJ)+S3(4,II,JJ)+S2(3,II,JJ)+S4(2,II,JJ)  PBS  138
       OVK(I+KZ,JN1+LZ)=OVK(I+KZ,JN1+LZ)+S1(2,II,JJ)                    PBS  139
       OVK(I+KZ,KN1+LZ)=OVK(I+KZ,KN1+LZ)+S1(3,II,JJ)                    PBS  140
       OVK(I+KZ,LN1+LZ)=OVK(I+KZ,LN1+LZ)+S1(4,II,JJ)                    PBS  141
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      OVK(I+KZ,IN2+LZ)=OVK(I+KZ,IN2+LZ)+S2(1,JJ,II)                    PBS  142
      OVK(I+KZ,JN2+LZ)=OVK(I+KZ,JN2+LZ)+S2(2,JJ,II)                    PBS  143
      OVK(I+KZ,LN2+LZ)=OVK(I+KZ,LN2+LZ)+S2(4,II,JJ)                    PBS  144
      OVK(I+KZ,IN3+LZ)=OVK(I+KZ,IN3+LZ)+S3(1,JJ,II)                    PBS  145
      OVK(I+KZ,JN3+LZ)=OVK(I+KZ,JN3+LZ)+S3(2,JJ,II)                    PBS  146
      OVK(I+KZ,KN3+LZ)=OVK(I+KZ,KN3+LZ)+S3(3,JJ,II)                    PBS  147
      OVK(I+KZ,IN4+LZ)=OVK(I+KZ,IN4+LZ)+S4(1,JJ,II)                    PBS  148
      OVK(I+KZ,KN4+LZ)=OVK(I+KZ,KN4+LZ)+S4(3,II,JJ)                    PBS  149
      OVK(I+KZ,LN4+LZ)=OVK(I+KZ,LN4+LZ)+S4(4,II,JJ)                    PBS  150
   60 CONTINUE                                                         PBS  151
C                                                                      PBS  152
C     CONTRIBUTION OF STIFFENER ELEMENTS //X-AXIS.                     PBS  153
C                                                                      PBS  154
      IF (NBEAMX.EQ.0) GO TO 90                                        PBS  155
      READ (13) NPARX,NXL,NXR,NPIX,NPKX                                PBS  156
      NL(1)=NXL                                                        PBS  157
      NL(2)=NXR                                                        PBS  158
      IF (NPARX.EQ.0) GO TO 90                                         PBS  159
      CALL BEASTX (M,NL,NUMNP,NIX,NBEAMX,NULAYB,KC,KMAT,ZORD,ASXLR,AILR,PBS  160
     1ITYPE,ESX,TSHEAR,RON,ROM,SIGO,RONT,ROMT,FT,SIBXXC,SIBXXA)        PBS  161
C                                                                      PBS  162
C     FIND MATRIX LOCATIONS                                            PBS  163
C                                                                      PBS  164
      IL=NPIX                                                          PBS  165
      KR=NPKX                                                          PBS  166
      I=1                                                              PBS  167
      IL=5*IL-4                                                        PBS  168
      KR=5*KR-4                                                        PBS  169
C                                                                      PBS  170
C     STORAGE IN AUXILIARY ARRAY OVM(I,J)                              PBS  171
C                                                                      PBS  172
      DO 80 II=1,5                                                     PBS  173
C                                                                      PBS  174
      IF (LILA(IP+II-1).NE.2) GO TO 70                                 PBS  175
      BBS2(1,II,II)=BBS2(1,II,II)*COMET                                PBS  176
      BBS1(2,II,II)=BBS1(2,II,II)*COMET                                PBS  177
   70 CONTINUE                                                         PBS  178
C                                                                      PBS  179
      DO 80 JJ=1,5                                                     PBS  180
      KZ=II-1                                                          PBS  181
      LZ=JJ-1                                                          PBS  182
      OVK(I+KZ,IP+LZ)=OVK(I+KZ,IP+LZ)+BBS2(1,II,JJ)+BBS1(2,II,JJ)     PBS  183
      OVK(I+KZ,IL+LZ)=OVK(I+KZ,IL+LZ)+BBS1(1,JJ,II)                   PBS  184
      OVK(I+KZ,KR+LZ)=OVK(I+KZ,KR+LZ)+BBS2(2,II,JJ)                   PBS  185
   80 CONTINUE                                                         PBS  186
C                                                                      PBS  187
C     TRANSFER INTO ARRAY ALL(I,J)                                     PBS  188
C                                                                      PBS  189
   90 DO 100 IA=1,LWIDTH                                               PBS  190
      ALL(IA,KJ-4)=OVK(1,IA+K-5)                                       PBS  191
      ALL(IA,KJ-3)=OVK(2,IA+K-4)                                       PBS  192
      ALL(IA,KJ-2)=OVK(3,IA+K-3)                                       PBS  193
      ALL(IA,KJ-1)=OVK(4,IA+K-2)                                       PBS  194
      ALL(IA,KJ)=OVK(5,IA+K-1)                                         PBS  195
  100 CONTINUE                                                         PBS  196
C                                                                      PBS  197
C     IMPOSE BOUNDARY CONDITIONS.                                      PBS  198
C                                                                      PBS  199
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      DO 110 LK=1,5                                                     PBS  200
      IF (LILA(IP+LK-1).EQ.0) GO TO 110                                 PBS  201
      IF (LILA(IP+LK-1).EQ.2) GO TO 110                                 PBS  202
      ALL(1,KJ+LK-5)=ALL(1,KJ+LK-5)*COMET                               PBS  203
  110 CONTINUE                                                          PBS  204
  120 CONTINUE                                                          PBS  205
C                                                                       PBS  206
C     TRANSFER TO TAPE 3                                                PBS  207
C                                                                       PBS  208
      WRITE (3) ALL                                                     PBS  209
      KOUNT=KOUNT+1                                                     PBS  210
C                                                                       PBS  211
C     CHECK IF ALL BLOCKS HAVE BEEN OBTAINED                            PBS  212
C                                                                       PBS  213
      GO TO 20                                                          PBS  214
  130 END FILE 3                                                        PBS  215
      RETURN                                                            PBS  216
      END                                                               PBS  217
      SUBROUTINE BEASTX (M,NL,NUMNP,NIX,NBEAMX,NULAYB,KC,KMAT,ZCRD,ASXLRBEASTX  2
     1,AILR,ITYPE,ESX,TSHEAR,RON,ROM,SIGO,RONT,ROMT,FT,SIBXXC,SIBXXA)    BEASTX  3
C                                                                       BEASTX  4
C     THIS SUBROUTINE GENERATES THE BEAM-ELEMENT STIFFNESS BY ASSEMBLINGBEASTX  5
C     TOTAL STIFFNESS LAYER BY LAYER AND CONSIDERING THE PRESENT STATE OBEASTX  6
C     STRESS IN EACH LAYER.THE STIFFENER IS ASSUMED TO BE IN A UNIAXIAL BEASTX  7
C     STATE OF STRESS AND THE INTERACTION OF THE TORSIONAL MOMENT ON BENBEASTX  8
C     IS NEGLECTED IN THE PRESENT ANALYSIS                              BEASTX  9
C                                                                       BEASTX 10
C                                                                       BEASTX 11
C     COMPUTE SIFFNESS MATRIX FOR BEAM ELEMENT                          BEASTX 12
C                    NODE *  1  *  2  *                                 BEASTX 13
C                  ********************                                 BEASTX 14
C                         *     *     *                                 BEASTX 15
C                      1  * BS1 * BS2 *                                 BEASTX 16
C                         *     *     *                                 BEASTX 17
C                  ********************                                 BEASTX 18
C                         *     *     *                                 BEASTX 19
C                      2  * BS3 * BS4 *                                 BEASTX 20
C                         *     *     *                                 BEASTX 21
C                  ********************                                 BEASTX 22
C                                                                       BEASTX 23
      DIMENSION BBS1(2,5,5), BBS2(2,5,5), NL(2)                         BEASTX 24
      DIMENSION ESX(NULAYB,NBEAMX), RON(KMAT), ROM(KMAT), SIBXXA(NULAYB)BEASTX 25
     1, SIBXXC(NULAYB), ASXLR(NULAYB), ZCRD(NULAYB), AILR(NULAYB), ITYPEBEASTX 26
     2(NULAYB), TSHEAR(NULAYB), RONT(KC), ROMT(KC), SIGO(KMAT), FT(KMAT)BEASTX 27
     3, DUMMY(1)                                                        BEASTX 28
C                                                                       BEASTX 29
      COMMON /CB19/ BBS1,BBS2                                           BEASTX 30
      COMMON /CB309/ FTOL,CTOL                                          BEASTX 31
      DO 70 NR=1,2                                                      BEASTX 32
      N=NL(NR)                                                          BEASTX 33
      IF (N.GE.NIX) GO TO 50                                            BEASTX 34
C                                                                       BEASTX 35
      READ (14) XLNGTH,GKEIX,ITYPE,ASXLR,AILR,ZCRD,TSHEAR               BEASTX 36
      READ (15) SIBXXA                                                  BEASTX 37
      READ (24) SIBXXC                                                  BEASTX 38
C                                                                       BEASTX 39
      BASX=0.0                                                          BEASTX 40
      BEIX=0.0                                                          BEASTX 41
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      BSSX=0.0                                                          BEASTX42
      A=XLNGTH                                                          BEASTX43
      AA=A**2                                                           BEASTX44
      DO 20 ML=1,NULAYB                                                 BEASTX45
      S=SIBXXC(ML)+SIBXXA(ML)                                           BEASTX46
      ZASX=ASXLR(ML)                                                    BEASTX47
C                                                                       BEASTX48
C     ADD CONTRIBUTION FROM ALL LAYERS                                  BEASTX49
C                                                                       BEASTX50
      ZSSX=ZASX*ZCRD(ML)                                                BEASTX51
      ZEIX=ZSSX*ZCRD(ML)+AILR(ML)                                       BEASTX52
      K=ITYPE(ML)                                                       BEASTX53
C                                                                       BEASTX54
C     GET STRESS-STRAIN RELATION                                        BEASTX55
C                                                                       BEASTX56
      ZESX=ESX(ML,N)/(1.+RON(K)*(1.-ROM(K))/ROM(K)*((ABS(S)/SIGO(K))**(RBEASTX57
     1ON(K)-1.)))                                                       BEASTX58
C                                                                       BEASTX59
      IF (S.GT.0.0.AND.K.LE.KC) ZESX=ESX(ML,N)/(1.+RONT(K)*(1.-ROMT(K))/BEASTX60
     1ROMT(K)*((ABS(S)/FT(K))**(RONT(K)-1.)))                           BEASTX61
C                                                                       BEASTX62
      IF (K.GT.KC) GO TO 10                                             BEASTX63
      SP=-SIGO(K)                                                       BEASTX64
      IF (S.GT.0.0) SP=FT(K)                                            BEASTX65
      IF (ABS(S).GT.ABS(SP)) ZESX=0.0                                   BEASTX66
C                                                                       BEASTX67
   10 CONTINUE                                                          BEASTX68
C                                                                       BEASTX69
C     ADD LAYER STIFFNESS TERMS FOR INPLANE, COUPLING, AND BENDING      BEASTX70
C         ACTIONS                                                       BEASTX71
C                                                                       BEASTX72
      BSSX=BSSX+ZSSX*ZESX                                               BEASTX73
      BEIX=BEIX+ZEIX*ZESX                                               BEASTX74
      BASX=BASX+ZASX*ZESX                                               BEASTX75
C                                                                       BEASTX76
   20 CONTINUE                                                          BEASTX77
C                                                                       BEASTX78
      ZSSX=BSSX/A/A/A                                                   BEASTX79
      ZEIX=BEIX/A/A/A                                                   BEASTX80
      ZASX=BASX/A/A/A                                                   BEASTX81
C                                                                       BEASTX82
C     BBS1(1) = BS3 OR BS2 TRANSPOSED                                   BEASTX83
C     BBS2(1) = BS4                                                     BEASTX84
C     BBS1(2) = BS1                                                     BEASTX85
C     BBS2(2) = BS2                                                     BEASTX86
C                                                                       BEASTX87
C     GET ELEMENT STIFFNESS SUBMATRICES                                 BEASTX88
C                                                                       BEASTX89
      GO TO (30,40), NR                                                 BEASTX90
   30 CONTINUE                                                          BEASTX91
C                                                                       BEASTX92
      S53=+1.0                                                          BEASTX93
      S55=+.50                                                          BEASTX94
      S11=-1.0                                                          BEASTX95
      S15=-1.0                                                          BEASTX96
      S33=-1.0                                                          BEASTX97
      S35=-1.0                                                          BEASTX98
      S51=-1.0                                                          BEASTX99
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      CALL SUBH (BBS1,NR,ZSSX,ZEIX,ZASX,A,AA,S11,S15,S33,S35,S51,S53,S55BEAST100
     1)                                                                 BEAST101
C                                                                       BEAST102
      S11=+1.0                                                          BEAST103
      S15=+1.0                                                          BEAST104
      S33=+1.0                                                          BEAST105
      S35=+1.0                                                          BEAST106
      S51=+1.0                                                          BEAST107
      S53=+1.0                                                          BEAST108
      S55=+1.0                                                          BEAST109
      CALL SUBH (BBS2,NR,ZSSX,ZEIX,ZASX,A,AA,S11,S15,S33,S35,S51,S53,S55BEAST110
     1)                                                                 BEAST111
C                                                                       BEAST112
      GO TO 70                                                          BEAST113
   40 CONTINUE                                                          BEAST114
C                                                                       BEAST115
      S11=+1.0                                                          BEAST116
      S15=+1.0                                                          BEAST117
      S33=+1.0                                                          BEAST118
      S51=+1.0                                                          BEAST119
      S55=+1.0                                                          BEAST120
      S35=-1.0                                                          BEAST121
      S53=-1.0                                                          BEAST122
      CALL SUBH (BBS1,NR,ZSSX,ZEIX,ZASX,A,AA,S11,S15,S33,S35,S51,S53,S55BEAST123
     1)                                                                 BEAST124
C                                                                       BEAST125
      S55=+.50                                                          BEAST126
      S53=+1.0                                                          BEAST127
      S11=-1.0                                                          BEAST128
      S15=-1.0                                                          BEAST129
      S33=-1.0                                                          BEAST130
      S35=-1.0                                                          BEAST131
      S51=-1.0                                                          BEAST132
      CALL SUBH (BBS2,NR,ZSSX,ZEIX,ZASX,A,AA,S11,S15,S33,S35,S51,S53,S55BEAST133
     1)                                                                 BEAST134
C                                                                       BEAST135
      GO TO 70                                                          BEAST136
   50 DO 60 I=1,5                                                       BEAST137
      DO 60 J=1,5                                                       BEAST138
      BBS1(NR,I,J)=0.                                                   BEAST139
      BBS2(NR,I,J)=0.                                                   BEAST140
   60 CONTINUE                                                          BEAST141
C                                                                       BEAST142
C     GO TO ANOTHER ELEMENT WHICH CONTRIBUTES STIFFNESS TERMS TO NODE M BEAST143
C                                                                       BEAST144
   70 CONTINUE                                                          BEAST145
      RETURN                                                            BEAST146
      END                                                               BEAST147
      SUBROUTINE ELSTMA (NCNS,NANA,NULAY,NUMNP,NUMEL,NSLAYR,NSMAT,M,NZ,MELSTMA 2
     1M,LILA,NA1,PZC,PDT,SZC,SDT,SXXOT,SYYOT,SXYOT,SIGXXO,SIGYYO,SIGXYO,ELSTMA 3
     2AS1,AF,AS,SPHI,NSTYPE,SPROM,SPRON,SEMOD,SIGMAP)                   ELSTMA 4
C                                                                       ELSTMA 5
C     THIS SUBROUTINE GENERATES THE ELEMENT STIFFNESS MATRIX BY         ELSTMA 6
C     ASSEMBLING THE STIFFNESS LAYER BY LAYER AND CONSIDERING THE       ELSTMA 7
C     PRESENT STATE OF STRESS IN A LAYER.                               ELSTMA 8
      DIMENSION KT(3,3)                                                 ELSTMA 9
      DIMENSION MM(4,4), LILA(NA1)                                      ELSTMA10
      DIMENSION                                                         ELSTMA11
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     *PDT(NULAY),PZC(NULAY),                                                ELSTMA12
     *SXXOT(NCNS), SYYOT(NCNS), SXYOT(NCNS),                                ELSTMA13
     *SIGXXO(NCNS),SIGYYO(NCNS),SIGXYO(NCNS),                               ELSTMA14
     *SDT(NSLAYR ), SZC(NSLAYR ),                                           ELSTMA15
     *DUMMY(1)                                                              ELSTMA16
C                                                                           ELSTMA17
      DIMENSION IULOC(4,4), JULOC(4,4), KUU(8,8), AK3(8,8), K1(12,12), KELSTMA18
     12(12,12), K3(12,12), K4(12,12), K5(12,12), K6(12,12), CTU(8,8), AKELSTMA19
     21(12,12), AK2(12,12), NZ(4), DDD(3,3), CCB(12,12)                     ELSTMA20
      DIMENSION C8(12,12)                                                   ELSTMA21
      DIMENSION S1(4,5,5), S2(4,5,5), S3(4,5,5), S4(4,5,5)                  ELSTMA22
      DIMENSION ILOC(4,4), JLOC(4,4)                                        ELSTMA23
      DIMENSION ICLOC(4,8), JCLOC(4,8)                                      ELSTMA24
      DIMENSION CCU(8,8), KUO(8,12), AKU(8,12)                              ELSTMA25
      COMMON /C809/ S1,S2,S3,S4                                             ELSTMA26
      COMMON /C8S301/ COUPLE                                                ELSTMA27
      COMMON /TUOO/ TUO(8,12)                                               ELSTMA28
      COMMON /SKEW/ PHI,AU(2,2),AO(3,3),DS(3,3)                             ELSTMA29
C                                                                           ELSTMA30
      REAL KT                                                               ELSTMA31
      REAL KUU                                                              ELSTMA32
      REAL KUO                                                              ELSTMA33
      REAL K1,K2,K3,K4,K5,K6                                                ELSTMA34
      DATA ((ILOC(I,J),J=1,4),I=1,4)/0,0,0,0,0,3,6,6,0,3,6,9,0,3,3,3/       ELSTMA35
      DATA ((JLOC(I,J),J=1,4),I=1,4)/0,3,6,9,6,6,6,9,9,9,9,9,3,3,6,9/       ELSTMA36
      DATA ((ICLOC(I,J),J=1,8),I=1,4)/0,0,0,0,0,2,4,6,0,2,4,4,4,4,4,6,0,ELSTMA37
     12,4,6,6,6,6,6,0,2,2,2,2,2,4,6/                                        ELSTMA38
      DATA ((JCLOC(I,J),J=1,8),I=1,4)/-2,1,4,7,-2,-2,-2,-2,4,4,4,7,-2,1,ELSTMA39
     14,4,7,7,7,7,-2,1,4,7,1,1,4,7,-2,1,1,1/                                ELSTMA40
      DATA ((IULOC(I,J),J=1,4),I=1,4)/0,0,0,0,0,2,4,4,0,2,4,6,0,2,2,2/      ELSTMA41
      DATA ((JULOC(I,J),J=1,4),I=1,4)/0,2,4,6,4,4,4,6,6,6,6,6,2,2,4,6/      ELSTMA42
C                                                                           ELSTMA43
C                                                                           ELSTMA44
      DATA ((K1(I,J),J=1,12),I=1,12)/0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0ELSTMA45
     1,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0ELSTMA46
     2.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,15.0,0.0,0.ELSTMA47
     30,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,ELSTMA48
     40.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.ELSTMA49
     50,0.0,0.0,0.0,45.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.ELSTMA50
     6,5.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0,ELSTMA51
     7.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0ELSTMA52
     8,0.0,0.0,0.0,0.0,0.0,0.0,15.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,ELSTMA53
     90.0,0.0,0.0,0.0/                                                      ELSTMA54
      DATA ((K2(I,J),J=1,12),I=1,12)/0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0ELSTMA55
     1,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0ELSTMA56
     2.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,15.ELSTMA57
     30,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,ELSTMA58
     40.0,0.0,0.0,0.0,0.0,15.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.ELSTMA59
     5.0,0.0,0.0,0.0,0.0,0.0,15.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.ELSTMA60
     60,0.0,0.0,15.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,15.0,0.0,0.0,0.0,0.ELSTMA61
     70,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,15.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0ELSTMA62
     8,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,15.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,ELSTMA63
     90.0,0.0,0.0,15.0,0.0/                                                 ELSTMA64
      DATA ((K3(I,J),J=1,12),I=1,12)/0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0ELSTMA65
     1,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0,ELSTMA66
     2.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,-15.0,0ELSTMA67
     3.0,0.0,0.0,0.0,0.0,-15.0,-15.0,0.0,0.0,0.0,-15.0,0.0,0.0,0.0,0.0,0ELSTMA68
     4.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0ELSTMA69
```

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     5,0.0,0.0,0.0,0.0,0.0,0.0,-30.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0ELSTMA70
     6,0.0,-30.0,0.0,-10.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,-10.0ELSTMA71
     7,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0ELSTMA72
     8.0,0.0,0.0,-15.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,-15.0ELSTMA73
     9,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0/                                  ELSTMA74
      DATA ((K4(I,J),J=1,12),I=1,12)/0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0ELSTMA75
     1,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0ELSTMA76
     2.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0ELSTMA77
     3,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0ELSTMA78
     4.0,0.0,0.0,0.0,0.0,0.0,0.0,15.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.ELSTMA79
     50,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,ELSTMA80
     60.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,5.0,0.0,0.0,0.ELSTMA81
     70,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,45.0,0.0,0.0,0.0,0.0,0.0,0.ELSTMA82
     8,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0ELSTMA83
     9.0,0.0,0.0,15.0/                                                   ELSTMA84
      DATA ((K5(I,J),J=1,12),I=1,12)/0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0ELSTMA85
     1,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0ELSTMA86
     2.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0ELSTMA87
     3,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,-15.0,0.0,0.0,0.0,0ELSTMA88
     4,0.0,0.0,0.0,0.0,0.0,0.0,-15.0,0.0,0.0,0.0,0.0,0.0,0.0,-15.0,-15.0,0.0ELSTMA89
     5,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0ELSTMA90
     6.0,0.0,0.0,-10.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,-10.0,0.0ELSTMA91
     7,-30.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,-30.0,0.0,0.0,0.0,0.0,0ELSTMA92
     8.0,0.0,0.0,0.0,0.0,-15.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0ELSTMA93
     9.0,-15.0,0.0,0.0,0.0,0.0,0.0,0.0/                                  ELSTMA94
      DATA ((K6(I,J),J=1,12),I=1,12)/0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0ELSTMA95
     1,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0ELSTMA96
     2.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0ELSTMA97
     3,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,15.0,0.0,0.0,0.0,0.0,0.0,ELSTMA98
     415.0,15.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,ELSTMA99
     50.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.ELSTM100
     60,20.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,20.0,0.0,0.ELSTM101
     70,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,0.0,ELSTM102
     80.0,15.0,0.0,0.0,0.0,0.0,0.0,27.0,15.0,0.0,0.0,0.0,0.0,15.0,0.0,0.0,ELSTM103
     90,0.0,0.0,0.0,15.0,27.0/                                           ELSTM104
      DATA ((CB(I,J),I=1,12),J=1,12)/.250,-.375,.375,0.000,-.500,0.000,.ELSTM105
     1125,0.000,0.000,-.125,.125,.125,-.125,.125,-.125,0.000,.125,.125,0ELSTM106
     2.000,0.000,-.125,.125,0.000,-.125,-.125,.125,-.125,.125,.125,0.000ELSTM107
     3,-.125,.125,0.000,0.000,-.125,0.000,.250,-.375,-.375,0.000,.500,0.ELSTM108
     4000,.125,0.000,0.000,.125,-.125,-.125,.125,-.125,-.125,0.000,.125,ELSTM109
     5-.125,0.000,0.000,.125,.125,0.000,-.125,-.125,.125,.125,.125,-.125ELSTM110
     6,0.000,-.125,-.125,0.000,0.000,.125,0.000,.250,.375,.375,0.000,.5ELSTM111
     70,0.000,-.125,0.000,0.000,-.125,-.125,-.125,-.125,-.125,-.125,0.00ELSTM112
     80,-.125,.125,0.000,0.000,.125,.125,0.000,.125,.125,.125,.125,-.125ELSTM113
     9,.125,0.000,-.125,-.125,0.000,0.000,-.125,0.000,.250,.375,-.375,0.ELSTM114
     $000,-.500,0.000,-.125,0.000,0.000,.125,.125,.125,.125,.125,-.125,0ELSTM115
     $.000,-.125,-.125,0.000,0.000,-.125,.125,0.000,.125,.125,.125,-.125ELSTM116
     $,-.125,-.125,0.000,-.125,.125,0.000,0.000,.125,0.000/              ELSTM117
      DATA ((CTU(I,J),I=1,8),J=1,8)/.25,-0.00,.25,-0.00,.25,-0.00,.25,-0ELSTM118
     1.00,-.25,-0.00,-.25,-0.00,.25,-0.00,.25,-0.00,.25,-0.00,-.25,-0.00ELSTM119
     2,.25,-0.00,-.25,-0.00,-.25,-0.00,.25,-0.00,.25,-0.00,-.25,-0.00,-ELSTM120
     3.00,.25,-0.00,.25,-0.00,.25,-0.00,.25,-0.00,-.25,-0.00,-.25,-0.00,ELSTM121
     4.25,-0.00,.25,-0.00,.25,-0.00,-.25,-0.00,.25,-0.00,-.25,-0.00,-.25ELSTM122
     5,-0.00,.25,-0.00,.25,-0.00,-.25/                                   ELSTM123
C                                                                        ELSTM124
C     INITIALIZE                                                         ELSTM125
C                                                                        ELSTM126
      DO 10 NE=1,4                                                       ELSTM127
```

```
      DO 10 J=1,5                                                       ELSTM128
      DO 10 I=1,5                                                       ELSTM129
      S1(NE,I,J)=0.0                                                    ELSTM130
      S2(NE,I,J)=0.0                                                    ELSTM131
      S3(NE,I,J)=0.0                                                    ELSTM132
      S4(NE,I,J)=0.0                                                    ELSTM133
   10 CONTINUE                                                          ELSTM134
C                                                                       ELSTM135
C     SELECT ELEMENTS AROUND NODE POINT                                 ELSTM136
C                                                                       ELSTM137
      DO 480 NR=1,4                                                     ELSTM138
      N=NZ(NR)                                                          ELSTM139
C                                                                       ELSTM140
C     CHECK IF THERE IS AN ELEMENT                                      ELSTM141
C                                                                       ELSTM142
      IF (N.EQ.NANA) GO TO 480                                          ELSTM143
C                                                                       ELSTM144
      READ (12) DT,ELLA,ELLB                                            ELSTM145
      READ (20) SIGXXO,SIGYYO,SIGXYO                                    ELSTM146
      READ (22) SXXOT,SYYOT,SXYOT                                       ELSTM147
C                                                                       ELSTM148
C     INITIALIZE                                                        ELSTM149
C                                                                       ELSTM150
      CONST1=0.0                                                        ELSTM151
      CONST2=0.0                                                        ELSTM152
      CONST3=0.0                                                        ELSTM153
      CONST4=0.0                                                        ELSTM154
      CONST5=0.0                                                        ELSTM155
      CONST6=0.0                                                        ELSTM156
      RD11=0.0                                                          ELSTM157
      RD12=0.0                                                          ELSTM158
      RD13=0.0                                                          ELSTM159
      RD22=0.0                                                          ELSTM160
      RD23=0.0                                                          ELSTM161
      RD33=0.0                                                          ELSTM162
      SD11=0.0                                                          ELSTM163
      SD12=0.0                                                          ELSTM164
      SD13=0.0                                                          ELSTM165
      SD22=0.0                                                          ELSTM166
      SD23=0.0                                                          ELSTM167
      SD33=0.0                                                          ELSTM168
C                                                                       ELSTM169
C     ASSIGN DIMENSIONS                                                 ELSTM170
C                                                                       ELSTM171
      A=ELLA                                                            ELSTM172
      B=ELLB                                                            ELSTM173
      ABAR=(PZC(1)-PDT(1)/2.0+PZC(NULAY)+PDT(NULAY)/2.0)                ELSTM174
      ABAR=ABAR*DT/2.0                                                  ELSTM175
C                                                                       ELSTM176
C     ADD CONTRIBUTIONS FROM ALL LAYERS                                 ELSTM177
C                                                                       ELSTM178
      DO 40 ML=1,NCNS                                                   ELSTM179
C                                                                       ELSTM180
C     GET STRESS-STRAIN RELATIONSHIP FOR LAYER                          ELSTM181
C                                                                       ELSTM182
      CALL DEMATR (N,ML,DDD,NUMEL,NCNS,NULAY,NSLAYR,NSMAT,SXXOT,SYYOT,SXELSTM183
     1YOT,SIGXXO,SIGYYO,SIGXYO,AS1,AF,AS,SPHI,NSTYPE,SPRON,SPROM,SEMOD,SELSTM184
     2IGMAP)                                                            ELSTM185
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```
C                                                                       ELSTM186
C     GET SKEW STRESS - STRAIN RELATIONSHIP                             ELSTM187
C                                                                       ELSTM188
      IF (ABS(PHI).NE.90.) CALL TRAT (DDD)                              ELSTM189
C                                                                       ELSTM190
      D11=DDD(1,1)                                                      ELSTM191
      D12=DDD(1,2)                                                      ELSTM192
      D13=DDD(1,3)                                                      ELSTM193
      D22=DDD(2,2)                                                      ELSTM194
      D23=DDD(2,3)                                                      ELSTM195
      D33=DDD(3,3)                                                      ELSTM196
C                                                                       ELSTM197
C     THIS IS TO TAKE CARE OF THE SIGN COMPATIBILITY BETWEEN INPLANE    ELSTM198
C     AND OUT OF PLANE ACTIONS                                          ELSTM199
C     THIS MODIFICATION ONLY FOR THE BENDING STIFFNESS MATRIX           ELSTM200
C                                                                       ELSTM201
      D13=-D13                                                          ELSTM202
      D23=-D23                                                          ELSTM203
      IF (ML.GT.NULAY) GO TO 20                                         ELSTM204
C                                                                       ELSTM205
C     CONCRETE LAYER GEOMETRY                                           ELSTM206
C                                                                       ELSTM207
      C1=(PZC(ML)-PDT(ML)/2.0)*DT                                       ELSTM208
      C2=(PZC(ML)+PDT(ML)/2.0)*DT                                       ELSTM209
      GO TO 30                                                          ELSTM210
   20 CONTINUE                                                          ELSTM211
C                                                                       ELSTM212
C     STEEL LAYER GEOMETRY                                              ELSTM213
C                                                                       ELSTM214
      C1=SZC(ML-NULAY)-SDT(ML-NULAY)/2.0                                ELSTM215
      C2=SZC(ML-NULAY)+SDT(ML-NULAY)/2.0                                ELSTM216
   30 CONTINUE                                                          ELSTM217
C                                                                       ELSTM218
C     SUM UP BENDING STIFFNESS CHARACTERISTICS                          ELSTM219
C                                                                       ELSTM220
      CCC=(C2*C2*C2-C1*C1*C1)/3.0+(C2-C1)*(ABAR*ABAR-ABAR*(C2+C1))      ELSTM221
      CONST1=CONST1+D11*CCC                                             ELSTM222
C                                                                       ELSTM223
C     SUM UP INPLANE STIFFNESS CHARACTERISTICS                          ELSTM224
C                                                                       ELSTM225
      CONST2=CONST2+D12*CCC                                             ELSTM226
      CONST3=CONST3+D13*CCC                                             ELSTM227
      CONST4=CONST4+D22*CCC                                             ELSTM228
      CONST5=CONST5+D23*CCC                                             ELSTM229
      CONST6=CONST6+D33*CCC                                             ELSTM230
      D13=-D13                                                          ELSTM231
      D23=-D23                                                          ELSTM232
      ZFAC=C2-C1                                                        ELSTM233
      SD11=SD11+D11*ZFAC                                                ELSTM234
      SD12=SD12+D12*ZFAC                                                ELSTM235
      SD13=SD13+D13*ZFAC                                                ELSTM236
      SD22=SD22+D22*ZFAC                                                ELSTM237
      SD23=SD23+D23*ZFAC                                                ELSTM238
      SD33=SD33+D33*ZFAC                                                ELSTM239
      IF (COUPLE.NE.3HYES) GO TO 40                                     ELSTM240
C                                                                       ELSTM241
C     SUM UP COUPLING STIFFNESS CHARACTERISTICS                         ELSTM242
C                                                                       ELSTM243
```

```
      CC=(C2+C1-2.0*ABAR)*(C2-C1)/2.0                                   ELSTM244
      RD11=RD11+D11*CC                                                  ELSTM245
      RD12=RD12+D12*CC                                                  ELSTM246
      RD13=RD13+D13*CC                                                  ELSTM247
      RD22=RD22+D22*CC                                                  ELSTM248
      RD23=RD23+D23*CC                                                  ELSTM249
      RD33=RD33+D33*CC                                                  ELSTM250
C                                                                       ELSTM251
C     GO TO ANOTHER LAYER                                               ELSTM252
C                                                                       ELSTM253
   40 CONTINUE                                                          ELSTM254
C                                                                       ELSTM255
C     FOR COUPLING ONLY                                                 ELSTM256
C                                                                       ELSTM257
      IF (COUPLE.NE.3HYES) GO TO 60                                     ELSTM258
C                                                                       ELSTM259
C     INITIALIZE                                                        ELSTM260
C                                                                       ELSTM261
      DO 50 I=1,8                                                       ELSTM262
      DO 50 J=1,12                                                      ELSTM263
   50 KUO(I,J)=0.0                                                      ELSTM264
      D11=RD11                                                          ELSTM265
      D12=RD12                                                          ELSTM266
      D13=RD13                                                          ELSTM267
      D22=RD22                                                          ELSTM268
      D23=RD23                                                          ELSTM269
      D33=RD33                                                          ELSTM270
C                                                                       ELSTM271
C     D11 TERMS                                                         ELSTM272
      KUO(2,4)=-8.0*B*D11/A                                             ELSTM273
      KUO(4,8)=KUO(2,4)*B/3.0                                           ELSTM274
C                                                                       ELSTM275
C     D22 TERMS                                                         ELSTM276
      KUO(7,6)=-8.0*A*D22/B                                             ELSTM277
      KUO(8,9)=KUO(7,6)*A/3.0                                           ELSTM278
C                                                                       ELSTM279
C     D33 TERMS                                                         ELSTM280
      KUO(3,5)=-8.0*D33                                                 ELSTM281
      KUO(6,5)=KUO(3,5)                                                 ELSTM282
      KUO(3,11)=KUO(3,5)                                                ELSTM283
      KUO(3,12)=KUO(3,5)                                                ELSTM284
      KUO(6,12)=KUO(3,5)                                                ELSTM285
      KUO(6,11)=KUO(3,5)                                                ELSTM286
      KUO(4,8)=KUO(4,8)-16.0*A*D33/3.0                                  ELSTM287
      KUO(8,9)=KUO(8,9)-16.*B*D33/3.0                                   ELSTM288
C                                                                       ELSTM289
C     D12 TERMS                                                         ELSTM290
      KUO(2,6)=-8.0*A*D12/B                                             ELSTM291
      KUO(4,10)=KUO(2,6)*B                                              ELSTM292
      KUO(7,4)=-8.*B*D12/A                                              ELSTM293
      KUO(8,7)=KUO(7,4)*A                                               ELSTM294
C                                                                       ELSTM295
C     D13 TERMS                                                         ELSTM296
      KUO(2,5)=-8.0*D13                                                 ELSTM297
      KUO(2,11)=KUO(2,5)                                                ELSTM298
      KUO(2,12)=KUO(2,5)                                                ELSTM299
      KUO(3,4)=-8.0*B*D13/A                                             ELSTM300
      KUO(4,7)=KUO(3,4)*A                                               ELSTM301
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      KUO(4,9)=-16.*B*D13/3.0                                          ELSTM302
      KUO(6,4)=KUO(3,4)                                                ELSTM303
      KUO(8,8)=-8.0*B*B*D13/(3.0*A)                                    ELSTM304
C                                                                      ELSTM305
C     D23 TERMS                                                        ELSTM306
      KUO(3,6)=-8.*A*D23/8                                             ELSTM307
      KUO(4,9)=KUO(4,9)-8.0*A*A*D23/(3.*B)                             ELSTM308
      KUO(6,6)=KUO(3,6)                                                ELSTM309
      KUO(7,5)=-8.*D23                                                 ELSTM310
      KUO(7,11)=KUO(7,5)                                               ELSTM311
      KUO(7,12)=KUO(7,5)                                               ELSTM312
      KUO(8,8)=KUO(8,8)-16.*D23*A/3.0                                  ELSTM313
      KUO(8,10)=-8.*A*D23                                              ELSTM314
   60 CONTINUE                                                         ELSTM315
C                                                                      ELSTM316
C     FOR INPLANE STIFFNESS                                            ELSTM317
C                                                                      ELSTM318
      D11=SD11                                                         ELSTM319
      D12=SD12                                                         ELSTM320
      D13=SD13                                                         ELSTM321
      D22=SD22                                                         ELSTM322
      D23=SD23                                                         ELSTM323
      D33=SD33                                                         ELSTM324
C                                                                      ELSTM325
C     IN PLANE                                                         ELSTM326
      DO 70 I=1,8                                                      ELSTM327
      DO 70 J=1,8                                                      ELSTM328
   70 KUU(I,J)=0.                                                      ELSTM329
      KUU(2,2)=D11                                                     ELSTM330
      KUU(3,2)=D13                                                     ELSTM331
      KUU(2,3)=D13                                                     ELSTM332
      KUU(6,2)=D13                                                     ELSTM333
      KUU(2,6)=D13                                                     ELSTM334
      KUU(7,2)=D12                                                     ELSTM335
      KUU(2,7)=D12                                                     ELSTM336
      KUU(3,3)=D33                                                     ELSTM337
      KUU(6,6)=D33                                                     ELSTM338
      KUU(6,3)=D33                                                     ELSTM339
      KUU(3,6)=D33                                                     ELSTM340
      KUU(7,3)=D23                                                     ELSTM341
      KUU(3,7)=D23                                                     ELSTM342
      KUU(7,6)=D23                                                     ELSTM343
      KUU(6,7)=D23                                                     ELSTM344
      KUU(4,4)=D11*B*B/3.0+D33*A*A/3.0                                 ELSTM345
      KUU(8,4)=D23*A*A/3.0+D13*B*B/3.0                                 ELSTM346
      KUU(4,8)=D23*A*A/3.0+D13*B*B/3.0                                 ELSTM347
      KUU(7,7)=D22                                                     ELSTM348
      KUU(8,8)=D22*A*A/3.0+D33*B*B/3.0                                 ELSTM349
      DO 80 I=1,8                                                      ELSTM350
      DO 80 J=1,8                                                      ELSTM351
   80 KUU(I,J)=KUU(I,J)*4.0*A*B                                        ELSTM352
C                                                                      ELSTM353
C                                                                      ELSTM354
C     FOR BENDING                                                      ELSTM355
C                                                                      ELSTM356
      C=16.0/15.0                                                      ELSTM357
C                                                                      ELSTM358
C     FORM BENDING AND INPLANE C MATRICES                              ELSTM359
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C                                                                       ELSTM360
      CONST1=CONST1*C*B/(A*A*A)                                         ELSTM361
      CONST2=CONST2*C/(A*B)                                             ELSTM362
      CONST3=CONST3*C/(A*A)                                             ELSTM363
      CONST4=CONST4*C*A/(B*B*B)                                         ELSTM364
      CONST5=CONST5*C/(B*B)                                             ELSTM365
      CONST6=CONST6*C/(A*B)                                             ELSTM366
      DO 90 I=1,12                                                      ELSTM367
      DO 90 J=1,12                                                      ELSTM368
   90 AK1(I,J)=K1(I,J)*CONST1+K2(I,J)*CONST2+K3(I,J)*CONST3+K4(I,J)*CONSELSTM369
     1T4+K5(I,J)*CONST5+K6(I,J)*CONST6                                  ELSTM370
      DO 100 I=1,12                                                     ELSTM371
      DO 100 J=1,12,3                                                   ELSTM372
      CCB(I,J)=CB(I,J)                                                  ELSTM373
      CCB(I,J+1)=CB(I,J+1)*B                                            ELSTM374
      CCB(I,J+2)=CB(I,J+2)*A                                            ELSTM375
  100 CONTINUE                                                          ELSTM376
      DO 110 I=1,8                                                      ELSTM377
      DO 110 J=1,5,4                                                    ELSTM378
      CCU(I,J)=CTU(I,J)                                                 ELSTM379
      CCU(I,J+1)=CTU(I,J+1)/A                                           ELSTM380
      CCU(I,J+2)=CTU(I,J+2)/B                                           ELSTM381
      CCU(I,J+3)=CTU(I,J+3)/(A*B)                                       ELSTM382
  110 CONTINUE                                                          ELSTM383
C                                                                       ELSTM384
C     FORM IN PLANE STIFF                                               ELSTM385
C                                                                       ELSTM386
      DO 130 I=1,8                                                      ELSTM387
      DO 130 J=1,8                                                      ELSTM388
      SUM=0.                                                            ELSTM389
      DO 120 K=1,8                                                      ELSTM390
  120 SUM=CCU(I,K)*KUU(K,J)+SUM                                         ELSTM391
  130 AK3(I,J)=SUM                                                      ELSTM392
C                                                                       ELSTM393
      DO 150 I=1,8                                                      ELSTM394
      DO 150 J=1,8                                                      ELSTM395
      SUM=0.                                                            ELSTM396
      DO 140 K=1,8                                                      ELSTM397
  140 SUM=SUM+AK3(I,K)*CCU(J,K)                                         ELSTM398
  150 KUU(I,J)=SUM                                                      ELSTM399
C                                                                       ELSTM400
C                                                                       ELSTM401
C     FORM BENDING STIFFNESS                                            ELSTM402
C                                                                       ELSTM403
      DO 170 I=1,12                                                     ELSTM404
      DO 170 J=1,12                                                     ELSTM405
      SUM=0.                                                            ELSTM406
      DO 160 KQ=1,12                                                    ELSTM407
  160 SUM=SUM+AK1(I,KQ)*CCB(KQ,J)                                       ELSTM408
      AK2(I,J)=SUM                                                      ELSTM409
  170 CONTINUE                                                          ELSTM410
C                                                                       ELSTM411
      DO 190 I=1,12                                                     ELSTM412
      DO 190 J=1,12                                                     ELSTM413
      SUM=0.                                                            ELSTM414
      DO 180 KQ=1,12                                                    ELSTM415
  180 SUM=SUM+CCB(KQ,I)*AK2(KQ,J)                                       ELSTM416
  190 AK1(I,J)=SUM                                                      ELSTM417
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C                                                                       ELSTM418
      IF (COUPLE.NE.3HYES) GO TO 300                                    ELSTM419
C                                                                       ELSTM420
C     FORM COUPLING STIFFNESS                                           ELSTM421
C                                                                       ELSTM422
      DO 210 I=1,8                                                      ELSTM423
      DO 210 J=1,12                                                     ELSTM424
      SUM=0.                                                            ELSTM425
      DO 200 KQ=1,12                                                    ELSTM426
  200 SUM=SUM+KUO(I,KQ)*CCB(KQ,J)                                       ELSTM427
      AKU(I,J)=SUM                                                      ELSTM428
  210 CONTINUE                                                          ELSTM429
      DO 230 I=1,8                                                      ELSTM430
      DO 230 J=1,12                                                     ELSTM431
      SUM=0.0                                                           ELSTM432
      DO 220 KQ=1,8                                                     ELSTM433
  220 SUM=SUM+CCU(I,KQ)*AKU(KQ,J)                                       ELSTM434
      KUO(I,J)=SUM                                                      ELSTM435
  230 CONTINUE                                                          ELSTM436
C                                                                       ELSTM437
      IF (ABS(ABAR).LT.0.001) GO TO 300                                 ELSTM438
C                                                                       ELSTM439
C     IF COUPLE = NO THEN ABAR MUST = 0.0                               ELSTM440
C                                                                       ELSTM441
      DO 250 I=1,12                                                     ELSTM442
      DO 250 J=1,12                                                     ELSTM443
      SUM=0.                                                            ELSTM444
      DO 240 K=1,8                                                      ELSTM445
  240 SUM=SUM+ABAR*TUO(K,I)*KUO(K,J)                                    ELSTM446
      AK1(J,I)=AK1(J,I)+SUM                                             ELSTM447
  250 AK1(I,J)=AK1(I,J)+SUM                                             ELSTM448
C                                                                       ELSTM449
      DO 270 I=1,8                                                      ELSTM450
      DO 270 J=1,12                                                     ELSTM451
      SUM=0.                                                            ELSTM452
      DO 260 K=1,8                                                      ELSTM453
  260 SUM=ABAR*KUU(I,K)*TUO(K,J)+SUM                                    ELSTM454
      KUO(I,J)=KUO(I,J)+SUM                                             ELSTM455
  270 AKU(I,J)=SUM                                                      ELSTM456
C                                                                       ELSTM457
C                                                                       ELSTM458
      DO 290 I=1,12                                                     ELSTM459
      DO 290 J=1,12                                                     ELSTM460
      SUM=0.                                                            ELSTM461
      DO 280 K=1,8                                                      ELSTM462
  280 SUM=SUM+ABAR*TUO(K,I)*AKU(K,J)                                    ELSTM463
  290 AK1(I,J)=AK1(I,J)+SUM                                             ELSTM464
C                                                                       ELSTM465
  300 CONTINUE                                                          ELSTM466
C                                                                       ELSTM467
C     APPLY BOUNDARY CONDITIONS ON SKEW STIFFNESS MATRIX                ELSTM468
C                                                                       ELSTM469
C     SELECT I,J,K,OR L                                                 ELSTM470
      DO 330 I=1,4                                                      ELSTM471
C                                                                       ELSTM472
C     SELECT U OR V INPLANE DISP                                        ELSTM473
C                                                                       ELSTM474
      DO 330 J=1,2                                                      ELSTM475
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      K=5*MM(NR,I)-5+J                                                  ELSTM476
      IF (LILA(K).NE.2) GO TO 330                                       ELSTM477
      NE=2*I-2+J                                                        ELSTM478
      DO 310 KQ=1,8                                                     ELSTM479
      KUU(NE,KQ)=0.0                                                    ELSTM480
  310 KUU(KQ,NE)=0.0                                                    ELSTM481
      DO 320 KQ=1,12                                                    ELSTM482
  320 KUO(NE,KQ)=0.                                                     ELSTM483
      KUU(NE,NE)=1.                                                     ELSTM484
  330 CONTINUE                                                          ELSTM485
C                                                                       ELSTM486
C     SELECT I,J,K,OR L                                                 ELSTM487
C                                                                       ELSTM488
      DO 360 I=1,4                                                      ELSTM489
C                                                                       ELSTM490
C     SELECT BENDING W,MX,MY                                            ELSTM491
C                                                                       ELSTM492
      DO 360 J=1,3                                                      ELSTM493
      K=5*MM(NR,I)-3+J                                                  ELSTM494
      IF (LILA(K).NE.2) GO TO 360                                       ELSTM495
      NE=3*I-3+J                                                        ELSTM496
      DO 340 KQ=1,12                                                    ELSTM497
      AK1(NE,KQ)=0.                                                     ELSTM498
  340 AK1(KQ,NE)=0.                                                     ELSTM499
      DO 350 KQ=1,8                                                     ELSTM500
  350 KUO(KQ,NE)=0.                                                     ELSTM501
      AK1(NE,NE)=1.                                                     ELSTM502
  360 CONTINUE                                                          ELSTM503
C                                                                       ELSTM504
C                                                                       ELSTM505
C     TRANSFORM TO CARTESIAN                                            ELSTM506
C     WHERE CARTESIAN FORCE = A * SKEW FORCE                            ELSTM507
C                                                                       ELSTM508
      IF (ABS(PHI).EQ.90.) GO TO 370                                    ELSTM509
      CALL TRA (KUU,KT,8,8,AU,2,AU,2)                                   ELSTM510
      CALL TRA (KUO,KT,8,12,AU,2,AO,3)                                  ELSTM511
      CALL TRA (AK1,KT,12,12,AO,3,AO,3)                                 ELSTM512
  370 CONTINUE                                                          ELSTM513
C                                                                       ELSTM514
C                                                                       ELSTM515
C     PUT BENDING AND INPLANE STIFFNESS TERMS INTO                      ELSTM516
C         APPROPRIATE LOCATIONS.                                        ELSTM517
C                                                                       ELSTM518
      GO TO (380,390,400,410), NR                                       ELSTM519
  380 CONTINUE                                                          ELSTM520
      CALL SADD (S1,NR,AK1,ILOC,JLOC)                                   ELSTM521
      CALL SKADD (S1,NR,KUU,IULOC,JULOC)                                ELSTM522
      GO TO 420                                                         ELSTM523
  390 CONTINUE                                                          ELSTM524
      CALL SADD (S2,NR,AK1,ILOC,JLOC)                                   ELSTM525
      CALL SKADD (S2,NR,KUU,IULOC,JULOC)                                ELSTM526
      GO TO 420                                                         ELSTM527
  400 CONTINUE                                                          ELSTM528
      CALL SADD (S3,NR,AK1,ILOC,JLOC)                                   ELSTM529
      CALL SKADD (S3,NR,KUU,IULOC,JULOC)                                ELSTM530
      GO TO 420                                                         ELSTM531
  410 CONTINUE                                                          ELSTM532
      CALL SADD (S4,NR,AK1,ILOC,JLOC)                                   ELSTM533
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      CALL SKADD (S4,NR,KUU,IULOC,JULOC)                                ELSTM534
  420 CONTINUE                                                          ELSTM535
      IF (COUPLE.NE.3HYES) GO TO 470                                    ELSTM536
      GO TO (430,440,450,460), NR                                       ELSTM537
C                                                                       ELSTM538
C     PUT COUPLING STIFFNESS TERMS INTO APPROPRIATE LOCATIONS           ELSTM539
C                                                                       ELSTM540
  430 CONTINUE                                                          ELSTM541
      CALL KUOADD (S1,NR,KUO,ICLOC,JCLOC)                               ELSTM542
      GO TO 470                                                         ELSTM543
  440 CONTINUE                                                          ELSTM544
      CALL KUOADD (S2,NR,KUO,ICLOC,JCLOC)                               ELSTM545
      GO TO 470                                                         ELSTM546
  450 CONTINUE                                                          ELSTM547
      CALL KUOADD (S3,NR,KUO,ICLOC,JCLOC)                               ELSTM548
      GO TO 470                                                         ELSTM549
  460 CONTINUE                                                          ELSTM550
      CALL KUOADD (S4,NR,KUO,ICLOC,JCLOC)                               ELSTM551
  470 CONTINUE                                                          ELSTM552
C                                                                       ELSTM553
C    GO TO ANOTHER ELEMENTT                                             ELSTM554
C                                                                       ELSTM555
  480 CONTINUE                                                          ELSTM556
      RETURN                                                            ELSTM557
      END                                                               ELSTM558
      SUBROUTINE TRA (K,KT,N,M,A,NA,B,NB)                               TRA     2
C                                                                       TRA     3
C     THIS SUBROUTINE TRANSFORMS STIFFNESS FROM SKEW TO CARTESIAN SYS   TRA     4
C                                                                       TRA     5
      DIMENSION K(N,M), KT(NA,NB), A(NA,NA), B(NB,NB)                   TRA     6
      REAL K,KT                                                         TRA     7
C                                                                       TRA     8
C     TRANSFORM STIFFNESS MATRIX USING NA BY NB CELLS                   TRA     9
C                                                                       TRA    10
C     K IS STIFFNESS IN SKEW SYSTEM                                     TRA    11
C     K = A*K*B-TRANSPOSED                                              TRA    12
C     K IS STIFFNESS IN CARTESIAN  SYSTEM                               TRA    13
C                                                                       TRA    14
C                                                                       TRA    15
      DO 50 II=1,N,NA                                                   TRA    16
      DO 50 JJ=1,M,NB                                                   TRA    17
C                                                                       TRA    18
      DO 20 I=1,NA                                                      TRA    19
      DO 20 J=1,NB                                                      TRA    20
      SUM=0.                                                            TRA    21
      DO 10 L=1,NA                                                      TRA    22
   10 SUM=SUM+A(I,L)*K(II+L-1,JJ+J-1)                                   TRA    23
   20 KT(I,J)=SUM                                                       TRA    24
C                                                                       TRA    25
C                                                                       TRA    26
      DO 40 I=1,NA                                                      TRA    27
      DO 40 J=1,NB                                                      TRA    28
      SUM=0.                                                            TRA    29
      DO 30 L=1,NB                                                      TRA    30
   30 SUM=SUM+KT(I,L)*B(J,L)                                            TRA    31
   40 K(II+I-1,JJ+J-1)=SUM                                              TRA    32
C                                                                       TRA    33
C                                                                       TRA    34
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   50 CONTINUE                                                          TRA   35
C                                                                       TRA   36
      RETURN                                                            TRA   37
      END                                                               TRA   38
      SUBROUTINE TRAT (DDD)                                             TRAT   2
C                                                                       TRAT   3
C     THIS SUBROUTINE GETS SKEW STRESS - STRAIN RELATIONSHIP            TRAT   4
C     WHERE  CARTESIAN STRAINS = DS * SKEW STRAINS                      TRAT   5
C                                                                       TRAT   6
      DIMENSION DDD(3,3), D(3,3)                                        TRAT   7
      COMMON /SKEW/ PHI,AU(2,2),AO(3,3),DS(3,3)                         TRAT   8
C                                                                       TRAT   9
      SINA=PHI*ATAN(1.0)/45.                                            TRAT  10
      SINA=SIN(SINA)                                                    TRAT  11
      DO 20 I=1,3                                                       TRAT  12
      DO 20 J=1,3                                                       TRAT  13
      SUM=0.                                                            TRAT  14
      DO 10 L=1,3                                                       TRAT  15
   10 SUM=SUM+DS(L,I)*DDD(L,J)                                          TRAT  16
   20 D(I,J)=SUM                                                        TRAT  17
C                                                                       TRAT  18
      DO 40 I=1,3                                                       TRAT  19
      DO 40 J=1,3                                                       TRAT  20
      SUM=0.                                                            TRAT  21
      DO 30 L=1,3                                                       TRAT  22
   30 SUM=SUM+D(I,L)*DS(L,J)                                            TRAT  23
   40 DDD(I,J)=SUM*SINA                                                 TRAT  24
      RETURN                                                            TRAT  25
      END                                                               TRAT  26
      SUBROUTINE SADD (S,NR,AK1,ILOC,JLOC)                              SADD   2
C                                                                       SADD   3
C     ADD CONTRIBUTION OF BENDING STIFFNESS TO ELEMENT STIFFNESS MATRIX SADD   4
C                                                                       SADD   5
      DIMENSION AK1(12,12)                                              SADD   6
      DIMENSION S(4,5,5)                                                SADD   7
      DIMENSION ILOC(4,4), JLOC(4,4)                                    SADD   8
      DO 10 N=1,4                                                       SADD   9
      IA=ILOC(NR,N)                                                     SADD  10
      JA=JLOC(NR,N)                                                     SADD  11
      DO 10 I=1,3                                                       SADD  12
      DO 10 J=1,3                                                       SADD  13
      S(N,I+2,J+2)=S(N,I+2,J+2)+AK1(I+IA,J+JA)                          SADD  14
   10 CONTINUE                                                          SADD  15
      RETURN                                                            SADD  16
      END                                                               SADD  17
      SUBROUTINE SKADD (S,NR,KUU,IULOC,JULOC)                           SKADD  2
C                                                                       SKADD  3
C     ADD INPLANE STIFFNESS TO ELEMENT MATRICES                         SKADD  4
C                                                                       SKADD  5
      DIMENSION S(4,5,5)                                                SKADD  6
      DIMENSION KUU(8,8), IULOC(4,4), JULOC(4,4)                        SKADD  7
      REAL KUU                                                          SKADD  8
      DO 10 N=1,4                                                       SKADD  9
      IADD=IULOC(NR,N)                                                  SKADD 10
      JADD=JULOC(NR,N)                                                  SKADD 11
      DO 10 I=1,2                                                       SKADD 12
      DO 10 J=1,2                                                       SKADD 13
      S(N,I,J)=S(N,I,J)+KUU(I+IADD,J+JADD)                              SKADD 14
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   10 CONTINUE                                                          SKADD 15
      RETURN                                                            SKADD 16
      END                                                               SKADD 17
      SUBROUTINE KUOADD (S,NR,KUO,ICLOC,JCLOC)                          KUOADD 2
C                                                                       KUOADD 3
C     ADD COUPLING STIFFNESS TO ELEMENT STIFFNESS MATRIX                KUOADD 4
C                                                                       KUOADD 5
      DIMENSION KUO(8,12)                                               KUOADD 6
      DIMENSION S(4,5,5)                                                KUOADD 7
      DIMENSION ICLOC(4,8), JCLOC(4,8)                                  KUOADD 8
      REAL KUO                                                          KUOADD 9
      DO 10 N=1,4                                                       KUOADD10
      IAIJ=ICLOC(NR,N)                                                  KUOADD11
      IAJI=ICLOC(NR,N+4)                                                KUOADD12
      JAIJ=JCLOC(NR,N)                                                  KUOADD13
      JAJI=JCLOC(NR,N+4)                                                KUOADD14
      DO 10 I=1,2                                                       KUOADD15
      DO 10 J=3,5                                                       KUOADD16
      S(N,I,J)=S(N,I,J)+KUO(I+IAIJ,J+JAIJ)                              KUOADD17
      S(N,J,I)=S(N,J,I)+KUO(I+IAJI,J+JAJI)                              KUOADD18
   10 CONTINUE                                                          KUOADD19
      RETURN                                                            KUOADD20
      END                                                               KUOADD21
      SUBROUTINE DEMATR (N,ML,DDD,NUMEL,NCNS,NULAY,NSLAYR,NSMAT,SXXOT,SYDEMATR 2
     1YOT,SXYOT,SIGXXO,SIGYYO,SIGXYO,AS1,AF,AS,SPHI,NSTYPE,SPRON,SPROM,SDEMATR 3
     2EMOD,SIGMAP)                                                      DEMATR 4
C                                                                       DEMATR 5
C     THIS SUBROUTINE COMPUTES STRESS-STRAIN RELATIONSHIP OF SLAB LAYER DEMATR 6
C                                                                       DEMATR 7
      DIMENSION SXXOT(NCNS), SYYOT(NCNS), SXYOT(NCNS), SIGXXO(NCNS), SIGDEMATR 8
     1YYO(NCNS), SIGXYO(NCNS), AS1(NUMEL,NCNS), AF(NUMEL,NULAY), AS(NUMEDEMATR 9
     2L,NULAY), SPHI(NSLAYR), NSTYPE(NSLAYR), SEMOD(NSMAT), SIGMAP(NSMATDEMATR10
     3), SPRON(NSMAT), SPROM(NSMAT), DD(3,3), DDD(3,3)                  DEMATR11
      COMMON /PROPC/ V,EC,FC,ECOMP,FT,ET,PCOMP,ALMM,SALMM,EALMM,ALICC   DEMATR12
      COMMON /COMPLT/ ICMPLT                                            DEMATR13
C                                                                       DEMATR14
C                                                                       DEMATR15
C     INITIALIZE                                                        DEMATR16
      DO 10 I=1,3                                                       DEMATR17
      DO 10 J=1,3                                                       DEMATR18
      DDD(I,J)=0.                                                       DEMATR19
   10 DD(I,J)=0.0                                                       DEMATR20
      EC1=0.                                                            DEMATR21
      EC2=0.                                                            DEMATR22
      ALPH1=0.0                                                         DEMATR23
      ALPH2=0.0                                                         DEMATR24
C                                                                       DEMATR25
C     CURRENT TOTAL STRESS LEVEL                                        DEMATR26
C                                                                       DEMATR27
      SX=SXXOT(ML)+SIGXXO(ML)                                           DEMATR28
      SY=SYYOT(ML)+SIGYYO(ML)                                           DEMATR29
      SXY=SXYOT(ML)+SIGXYO(ML)                                          DEMATR30
      IF (ML.GT.NULAY) GO TO 50                                         DEMATR31
C                                                                       DEMATR32
C     CHECK FOR LAYER FAILURE                                           DEMATR33
C                                                                       DEMATR34
      IF (AS1(N,ML).NE.999.0) GO TO 20                                  DEMATR35
      GO TO 40                                                          DEMATR36
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   20 CONTINUE                                                          DEMATR37
C                                                                       DEMATR38
C     A LAYER HAS CRACKED OR CRUSHED                                    DEMATR39
C                                                                       DEMATR40
C     CHECK IF THERE ARE TWO CRACKED - CRUSHED LINES                    DEMATR41
C                                                                       DEMATR42
      IF (AS(N,ML).NE.999.0) GO TO 100                                  DEMATR43
C                                                                       DEMATR44
C     FIND TRANSFORMATION ANGLE                                         DEMATR45
C                                                                       DEMATR46
      ANG=AS1(N,ML)                                                     DEMATR47
      ANGF=AF(N,ML)                                                     DEMATR48
      THETAS=ANG                                                        DEMATR49
C                                                                       DEMATR50
C     TRANSFORM STRESSES AND STRAINS TO CRACKED AXIS                    DEMATR51
C                                                                       DEMATR52
      CALL TRANG (SX,SY,SXY,ANG,S1,S2,S3)                               DEMATR53
C                                                                       DEMATR54
C     CHANGE SIGN                                                       DEMATR55
C                                                                       DEMATR56
      S1=-S1                                                            DEMATR57
      S2=-S2                                                            DEMATR58
      IF (ANG.EQ.ANGF) GO TO 30                                         DEMATR59
      CALL BAXIAL (S2,S1,ALPH2,SP2,EP2,DIRT2,EC2)                       DEMATR60
      IF (ABS(S2).GE.ABS(SP2)) EC2=0.0                                  DEMATR61
      GO TO 60                                                          DEMATR62
   30 CONTINUE                                                          DEMATR63
      CALL BAXIAL (S1,S2,ALPH1,SP1,EP1,DIRT1,EC1)                       DEMATR64
      IF (ABS(S1).GE.ABS(SP1)) EC1=0.0                                  DEMATR65
      GO TO 60                                                          DEMATR66
   40 CONTINUE                                                          DEMATR67
C                                                                       DEMATR68
C     FOR NO FAILURES                                                   DEMATR69
C                                                                       DEMATR70
      CALL PRNCIP (SX,SY,SXY,S1,S2,THETAS)                              DEMATR71
      S1=-S1                                                            DEMATR72
      S2=-S2                                                            DEMATR73
C                                                                       DEMATR74
C     CONSIDER 1 DIRECTION AS DIRECTION OF INTREST                      DEMATR75
C                                                                       DEMATR76
      CALL BAXIAL (S1,S2,ALPH1,SP1,EP1,DIRT1,EC1)                       DEMATR77
      IF (ABS(S1).GE.ABS(SP1)) EC1=0.0                                  DEMATR78
      IF (DIRT1.EQ.5HCRUSH.AND.EC1.EQ.0.0.AND.ICMPLT.EQ.3HYES) EC2=0.0  DEMATR79
C                                                                       DEMATR80
C     CONSIDER 2 DIRECTION AS DIRECTION OF INTREST                      DEMATR81
C                                                                       DEMATR82
      CALL BAXIAL (S2,S1,ALPH2,SP2,EP2,DIRT2,EC2)                       DEMATR83
      IF (ABS(S2).GE.ABS(SP2)) EC2=0.0                                  DEMATR84
      IF (DIRT2.EQ.5HCRUSH.AND.EC2.EQ.0.0.AND.ICMPLT.EQ.3HYES) EC1=0.0  DEMATR85
      GO TO 60                                                          DEMATR86
   50 CONTINUE                                                          DEMATR87
      THETAS=SPHI(ML-NULAY)                                             DEMATR88
C                                                                       DEMATR89
C     FOR STEEL LAYER                                                   DEMATR90
C                                                                       DEMATR91
      CALL TRANG (SX,SY,SXY,THETAS,S1,S2,S3)                            DEMATR92
      M=NSTYPE(ML-NULAY)                                                DEMATR93
      RN=SPRON(M)                                                       DEMATR94
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      RM=SPROM(M)                                                       DEMATR95
      ES=SEMOD(M)                                                       DEMATR96
      SIGMAY=SIGMAP(M)                                                  DEMATR97
      EC1=ES/(1.0+RN*(1.0-RM)/RM*((ABS(S1)/SIGMAY)**(RN-1.0)))          DEMATR98
   60 CONTINUE                                                          DEMATR99
C                                                                       DEMAT100
C     FIND V1 AND V2                                                    DEMAT101
C     FIND THE ELASTICITY RELATIONSHIP                                  DEMAT102
C                                                                       DEMAT103
      VA=V                                                              DEMAT104
      VB=V                                                              DEMAT105
      IF (EC1.EQ.0..AND.EC2.EQ.0.0) GO TO 100                           DEMAT106
      IF (EC1.EQ.0..OR.EC2.EQ.0.0) GO TO 70                             DEMAT107
      V1=V                                                              DEMAT108
      V2=(EC1*(1.0-V1*ALPH1)/(EC2*V1))+ALPH2                            DEMAT109
      V2=1.0/V2                                                         DEMAT110
      IF (V1.GE.0.0.AND.V2.GE.0.0) VB=V2                                DEMAT111
      IF (V1.GE.0.0.AND.V2.GE.0.0) VA=V1                                DEMAT112
      IF (V2.LE.V1.AND.V2.GE.0.0) GO TO 80                              DEMAT113
      V2=V                                                              DEMAT114
      V1=(EC2*(1.0-V2*ALPH2)/(EC1*V2))+ALPH1                            DEMAT115
      V1=1.0/V1                                                         DEMAT116
      IF (V1.GE.0.0.AND.V2.GE.0.0) VB=V2                                DEMAT117
      IF (V1.GE.0.0.AND.V2.GE.0.0) VA=V1                                DEMAT118
      IF (V1.LE.V2.AND.V1.GE.0.0) GO TO 80                              DEMAT119
      V1=VA                                                             DEMAT120
      V2=VB                                                             DEMAT121
      GO TO 80                                                          DEMAT122
   70 CONTINUE                                                          DEMAT123
      V1=0.                                                             DEMAT124
      V2=0.                                                             DEMAT125
      EC1=EC1*(1.0-V*ALPH1)                                             DEMAT126
      EC2=EC2*(1.0-V*ALPH2)                                             DEMAT127
      GO TO 90                                                          DEMAT128
   80 CONTINUE                                                          DEMAT129
      EC1=EC1*(1.0-V1*ALPH1)                                            DEMAT130
      EC2=EC2*(1.0-V2*ALPH2)                                            DEMAT131
   90 CONTINUE                                                          DEMAT132
C                                                                       DEMAT133
C     COMPUTE COUPLED DD MATRIX                                         DEMAT134
C                                                                       DEMAT135
      A=1.0-V1*V2                                                       DEMAT136
      DD(1,1)=EC1/A                                                     DEMAT137
      DD(1,2)=EC1*V2/A                                                  DEMAT138
      DD(2,1)=DD(1,2)                                                   DEMAT139
      DD(2,2)=EC2/A                                                     DEMAT140
      DD(3,3)=EC1*EC2/(EC1+EC2+2.0*EC2*V1)                              DEMAT141
C                                                                       DEMAT142
C     TRANSFORM TO X-Y COORDINATES                                      DEMAT143
C                                                                       DEMAT144
      CALL TRANS (DD,THETAS,DDD)                                        DEMAT145
  100 CONTINUE                                                          DEMAT146
      RETURN                                                            DEMAT147
      END                                                               DEMAT148
      SUBROUTINE SUBH (BBS,NR,ZSSX,ZEIX,ZASX,A,AA,S11,S15,S33,S35,S51,S5SUBH   2
     13,S55)                                                            SUBH   3
C                                                                       SUBH   4
C     THIS WILL SELECT A 5X5 MATRIX FROM THE BEAM ELEMENT               SUBH   5
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C      STIFFNESS MATRIX                                                  SUBH    6
C                                                                        SUBH    7
       DIMENSION BBS(2,5,5), BS(5,5)                                     SUBH    8
C                                                                        SUBH    9
       DO 10 I=1,5                                                       SUBH   10
       DO 10 J=1,5                                                       SUBH   11
       BS(I,J)=0.0                                                       SUBH   12
   10  CONTINUE                                                          SUBH   13
C                                                                        SUBH   14
       BS(1,1)=S11*ZASX*AA                                               SUBH   15
       BS(1,5)=S15*ZSSX*AA                                               SUBH   16
       BS(3,3)=S33*12.0*ZEIX                                             SUBH   17
       BS(3,5)=S35*6.0*ZEIX*A                                            SUBH   18
       BS(5,1)=S51*ZSSX*AA                                               SUBH   19
       BS(5,3)=S53*6.0*ZEIX*A                                            SUBH   20
       BS(5,5)=S55*4.0*ZEIX*AA                                           SUBH   21
C                                                                        SUBH   22
       DO 20 I=1,5                                                       SUBH   23
       DO 20 J=1,5                                                       SUBH   24
       BBS(NR,I,J)=BS(I,J)                                               SUBH   25
   20  CONTINUE                                                          SUBH   26
C                                                                        SUBH   27
       RETURN                                                            SUBH   28
       END                                                               SUBH   29
       OVERLAY  (ECCP,3,0)                                               OVERL3  2
       PROGRAM OVERL3                                                    OVERL3  3
C                                                                        OVERL3  4
C      SOLVE BASIC EQUATIONS,PRINT UNKNOWN DISPLACEMENTS AND REACTIONS.  OVERL3  5
C                                                                        OVERL3  6
       COMMON /OVER3/ N1,N2,N3,N4,N5,N6,N7,N8,N9,N10,N11                 OVERL3  7
       COMMON /CB01/ NUMEL,NANA,NUMNP,NETA,NA1,NULAY,NSLAYR,NCNS         OVERL3  8
       COMMON /CB3/ LWIDTH,NITA,NPSEGM                                   OVERL3  9
       COMMON /CB4/ IN,IO                                                OVERL310
       COMMON /DEADL/ IDEAD,ITERD,NITERD,ITRALD                          OVERL311
       COMMON /SEARCH/ ISRCH                                             OVERL312
       COMMON /ICORES/ ICR(2),ICORE                                      OVERL313
       COMMON A(1)                                                       OVERL314
C                                                                        OVERL315
C                                                                        OVERL316
       IF (ICORE.NE.0) GO TO 10                                          OVERL317
       ICORE=LOCF(A(1))+1                                                OVERL318
       GO TO 20                                                          OVERL319
   10  CONTINUE                                                          OVERL320
       NIETE=LWIDTH-1                                                    OVERL321
       NA5=NA1+LWIDTH-1                                                  OVERL322
       LAMA=5*NPSEGM                                                     OVERL323
       CALL SOL3 (NUMNP,NPSEGM,NA1,NA5,LWIDTH,LAMA,NIETE,A(N1),A(N2),A(N3OVERL324
      1),A(N4),A(N5),A(N6),A(N7),A(N8),A(N9),A(N10))                     OVERL325
   20  CONTINUE                                                          OVERL326
       END                                                               OVERL327
       SUBROUTINE SOL3 (NUMNP,NPSEGM,NA1,NA5,LWIDTH,LAMA,NIETE,C,X,Y,ALL,SOL3   2
      1AL,H,V,FORCE,LILA,DISP)                                           SOL3    3
C                                                                        SOL3    4
C      SOLUTION ROUTINE                                                  SOL3    5
C                                                                        SOL3    6
       DIMENSION C(NA1), X(NA5), Y(NA5), ALL(LWIDTH,LAMA), AL(LWIDTH,NIETSOL3   7
      1E), H(LWIDTH), V(LWIDTH), FORCE(NA1), LILA(NA1), DISP(NA1), DUMMY(SOL3   8
      21)                                                                SOL3    9
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```
C                                                                       SOL3  10
      COMMON /DEADL/ IDEAD,ITERD,NITERD,ITRALD                          SOL3  11
      COMMON /SKEW/ PHI                                                 SOL3  12
      COMMON /SEARCH/ ISRCH                                             SOL3  13
C                                                                       SOL3  14
C     READ FORCE VECTOR                                                 SOL3  15
C                                                                       SOL3  16
      REWIND 29                                                         SOL3  17
      REWIND 30                                                         SOL3  18
      READ (29) FORCE,LILA                                              SOL3  19
      IF (IDEAD.EQ.3HYES.AND.ISRCH.NE.3HYES) READ (29) FORCE            SOL3  20
C                                                                       SOL3  21
      ISEGM=NUMNP/NPSEGM                                                SOL3  22
C                                                                       SOL3  23
C     IMPOSE BOUNDARY CONDITIONS                                        SOL3  24
C                                                                       SOL3  25
C     APPLY BC TO FORCE VECTOR                                          SOL3  26
C                                                                       SOL3  27
      RPHI=PHI*ATAN(1.)/45.                                             SOL3  28
C                                                                       SOL3  29
C     0-FREE, 1-FIXED CATESIAN, 2-FIXED SKEW                            SOL3  30
C     SELECT NODE                                                       SOL3  31
C                                                                       SOL3  32
      DO 50 KK=1,NUMNP                                                  SOL3  33
C                                                                       SOL3  34
C     INPLANE                                                           SOL3  35
C                                                                       SOL3  36
      DO 20 N=1,2                                                       SOL3  37
      I=KK*5-5+N                                                        SOL3  38
      IF (LILA(I).EQ.0) GO TO 20                                        SOL3  39
      IF (LILA(I).NE.2) GO TO 10                                        SOL3  40
      IF (N.EQ.1) FORCE(I)=FORCE(I+1)/TAN(RPHI)                         SOL3  41
      IF (N.EQ.2) FORCE(I-1)=FORCE(I-1)-FORCE(I)/TAN(RPHI)              SOL3  42
      IF (N.EQ.2) FORCE(I)=0.                                           SOL3  43
      GO TO 20                                                          SOL3  44
   10 FORCE(I)=0.                                                       SOL3  45
   20 CONTINUE                                                          SOL3  46
C                                                                       SOL3  47
C     BENDING                                                           SOL3  48
C                                                                       SOL3  49
      DO 40 N=1,3                                                       SOL3  50
      I=5*KK-3+N                                                        SOL3  51
      IF (LILA(I).EQ.0) GO TO 40                                        SOL3  52
      IF (LILA(I).NE.2) GO TO 30                                        SOL3  53
      IF (N.EQ.1) GO TO 30                                              SOL3  54
      IF (N.EQ.2) FORCE(I+1)=FORCE(I)/TAN(RPHI)+FORCE(I+1)              SOL3  55
      IF (N.EQ.2) FORCE(I)=0.                                           SOL3  56
      IF (N.EQ.3) FORCE(I)=-FORCE(I-1)/TAN(RPHI)                        SOL3  57
      GO TO 40                                                          SOL3  58
   30 FORCE(I)=0.                                                       SOL3  59
   40 CONTINUE                                                          SOL3  60
C                                                                       SOL3  61
C     GO TO ANOTHER NODE                                                SOL3  62
C                                                                       SOL3  63
   50 CONTINUE                                                          SOL3  64
C                                                                       SOL3  65
      DO 60 I=1,NA1                                                     SOL3  66
      C(I)=FORCE(I)                                                     SOL3  67
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   60 CONTINUE                                                          SOL3  68
C                                                                       SOL3  69
C     SOLVE EQUATION SYSTEM                                             SOL3  70
C                                                                       SOL3  71
      CALL SOLV1 (C,X,LAMA,NIETE,ISEGM,LWIDTH,NA1,NUMNP,NPSEGM,NA5,ALL,ASOL3  72
     1L,H,V,Y)                                                          SOL3  73
C                                                                       SOL3  74
      DO 70 I=1,NA1                                                     SOL3  75
      DISP(I)=X(I)                                                      SOL3  76
   70 CONTINUE                                                          SOL3  77
C                                                                       SOL3  78
      WRITE (30) DISP                                                   SOL3  79
C                                                                       SOL3  80
      RETURN                                                            SOL3  81
      END                                                               SOL3  82
      SUBROUTINE SOLV1 (C,X,LAMA,NIETE,ISEGM,LWIDTH,NA1,NUMNP,NPSEGM,NA5SOLV1   2
     1,ALL,AL,H,V,Y)                                                    SOLV1   3
C                                                                       SOLV1   4
C                                                                       SOLV1   5
C     THIS SUBROUTINE SOLVES THE FORCE DISPLACEMENT EQUATIONS           SOLV1   6
C         BY USING THE CHOLESKI DECOMPOSITION METHOD                    SOLV1   7
C         AND WAS CODED BY A. W. WEGMULLER, FRITZ LAB REPORTS           SOLV1   8
C         378A.3 AND 378A.4                                             SOLV1   9
C                                                                       SOLV1  10
      DIMENSION C(NA1), X(NA5), Y(NA5), ALL(LWIDTH,LAMA), AL(LWIDTH,NIETSOLV1  11
     1E), H(LWIDTH), V(LWIDTH), DUMMY(1)                                SOLV1  12
      L=LWIDTH                                                          SOLV1  13
      N=LAMA                                                            SOLV1  14
      REWIND 3                                                          SOLV1  15
      REWIND 4                                                          SOLV1  16
      DO 10 K=1,NIETE                                                   SOLV1  17
   10 Y(K)=0.                                                           SOLV1  18
      DO 20 J=1,NIETE                                                   SOLV1  19
      DO 20 I=1,L                                                       SOLV1  20
      AL(I,J)=0.                                                        SOLV1  21
   20 CONTINUE                                                          SOLV1  22
      KOUNT=0                                                           SOLV1  23
      GO TO 40                                                          SOLV1  24
   30 IF (KZ2.EQ.NA1) GO TO 160                                         SOLV1  25
      KZ1=1+KOUNT*N                                                     SOLV1  26
      KZ2=NA1                                                           SOLV1  27
      GO TO 50                                                          SOLV1  28
   40 IF (KOUNT.GE.ISEGM) GO TO 30                                      SOLV1  29
      KZ1=1+KOUNT*N                                                     SOLV1  30
      KZ2=KZ1+N-1                                                       SOLV1  31
   50 READ (3) ALL                                                      SOLV1  32
      KZ3=0                                                             SOLV1  33
      DO 150 KZ=KZ1,KZ2                                                 SOLV1  34
      KZ3=KZ3+1                                                         SOLV1  35
      DO 60 I=1,L                                                       SOLV1  36
   60 V(I)=ALL(I,KZ3)                                                   SOLV1  37
      SUM=0.                                                            SOLV1  38
      DO 70 K=2,L                                                       SOLV1  39
      SUM=SUM+AL(K,L-K+1)**2                                            SOLV1  40
   70 CONTINUE                                                          SOLV1  41
      V(1)=1.0/SQRT(V(1)-SUM)                                           SOLV1  42
      NN=L-1                                                            SOLV1  43
      DO 90 M=2,NN                                                      SOLV1  44
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      LM=M-1                                                          SOLV1 45
      MM=L-M                                                          SOLV1 46
      SUM=0.                                                          SOLV1 47
      DO 80 K=1,MM                                                    SOLV1 48
      SUM=SUM+AL(LM+K+1,L-K)*AL(K+1,L-K)                              SOLV1 49
   80 CONTINUE                                                        SOLV1 50
      V(M)=(V(M)-SUM)*V(1)                                            SOLV1 51
   90 CONTINUE                                                        SOLV1 52
      V(L)=V(L)*V(1)                                                  SOLV1 53
      DO 100 I=1,L                                                    SOLV1 54
  100 ALL(I,KZ3)=V(I)                                                 SOLV1 55
      DO 110 I=1,NIETE                                                SOLV1 56
      K=L-I+1                                                         SOLV1 57
  110 H(I)=AL(K,I)                                                    SOLV1 58
      SUM=0.                                                          SOLV1 59
      DO 120 J=1,NIETE                                                SOLV1 60
  120 SUM=SUM+H(J)*Y(J+KZ-1)                                          SOLV1 61
      Y(NIETE+KZ)=(C(KZ)-SUM)*V(1)                                    SOLV1 62
      NIETA=NIETE-1                                                   SOLV1 63
      DO 130 J=1,NIETA                                                SOLV1 64
      DO 130 I=1,L                                                    SOLV1 65
      AL(I,J)=AL(I,J+1)                                               SOLV1 66
  130 CONTINUE                                                        SOLV1 67
      DO 140 I=1,L                                                    SOLV1 68
      AL(I,NIETE)=V(I)                                                SOLV1 69
  140 CONTINUE                                                        SOLV1 70
  150 CONTINUE                                                        SOLV1 71
      WRITE (4) ALL                                                   SOLV1 72
      KOUNT=KOUNT+1                                                   SOLV1 73
      GO TO 40                                                        SOLV1 74
  160 DO 170 K=1,NA1                                                  SOLV1 75
  170 Y(K)=Y(K+L-1)                                                   SOLV1 76
C     GENERATION OF UNKNOWN VECTOR X.                                 SOLV1 77
      NA=NA1+1                                                        SOLV1 78
      NB=L+NA1-1                                                      SOLV1 79
      DO 180 K=NA,NB                                                  SOLV1 80
  180 X(K)=0.                                                         SOLV1 81
      BACKSPACE 4                                                     SOLV1 82
      KOUNT=0                                                         SOLV1 83
      KZ2=0                                                           SOLV1 84
      KWP=NA1                                                         SOLV1 85
      IQUANT=ISEGM*NPSEGM-NUMNP                                       SOLV1 86
      IF (IQUANT) 190,200,200                                         SOLV1 87
  190 ISEGM=ISEGM+1                                                   SOLV1 88
      IQUANT=ISEGM*NPSEGM-NUMNP                                       SOLV1 89
      KZ1=1+5*IQUANT                                                  SOLV1 90
      KZ2=N                                                           SOLV1 91
      KZ3=5*IQUANT                                                    SOLV1 92
      KWP=5*ISEGM*NPSEGM                                              SOLV1 93
      GO TO 210                                                       SOLV1 94
  200 IF (KZ2.GE.NA1) GO TO 250                                       SOLV1 95
      KZ1=1+KOUNT*N                                                   SOLV1 96
      KZ2=KZ1+N-1                                                     SOLV1 97
      KZ3=0                                                           SOLV1 98
  210 READ (4) ALL                                                    SOLV1 99
      DO 240 KZ=KZ1,KZ2                                               SOLV1100
      DO 220 I=1,L                                                    SOLV1101
  220 H(I)=ALL(I,N-KZ3)                                               SOLV1102
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      SUM=0.                                                            SOLV1103
      DO 230 J=2,L                                                      SOLV1104
  230 SUM=SUM+H(J)*X(KWP+J-KZ)                                          SOLV1105
      X(KWP-KZ+1)=(Y(KWP-KZ+1)-SUM)*H(1)                                SOLV1106
      KZ3=KZ3+1                                                         SOLV1107
  240 CONTINUE                                                          SOLV1108
      BACKSPACE 4                                                       SOLV1109
      BACKSPACE 4                                                       SOLV1110
      KOUNT=KOUNT+1                                                     SOLV1111
      GO TO 200                                                         SOLV1112
  250 RETURN                                                            SOLV1113
      END                                                               SOLV1114
      OVERLAY  (ECCP,4,0)                                               OVERL4 2
      PROGRAM OVERL4                                                    OVERL4 3
C                                                                       OVERL4 4
C     THIS OVERLAY COMPUTES SOLUTIONS FOR INDIVIDUAL BEAMS PRIOR TO     OVERL4 5
C         OVERLOADING OF SUPERSTRUCTURE                                 OVERL4 6
C                                                                       OVERL4 7
      COMMON /OVER4/ N1,N2,N3,N4,N5,N6,N7,N8,N9,N10,N11,N12,N13,N14,N15,OVERL4 8
     1N16,N17,N18,N19,N20,N21,N22,N23,N24,N25,N26,N27                   OVERL4 9
      COMMON /BDIM/ RON(48)                                             OVERL410
      COMMON /CB4/ IN,IO                                                OVERL411
      COMMON /CB2/ NBEAMX,NIX,NULAYB                                    OVERL412
      COMMON /CB300/ NPERBM,NREADB,KSIG,KIN,KC,KMAT,KPS,NOBM,NNN        OVERL413
      COMMON /ICORES/ ICR(3),ICORE                                      OVERL414
      COMMON /SCALED/ ISCALE,IFN                                        OVERL415
      COMMON /CB305/ PCTT,PCTC                                          OVERL416
      COMMON A(1)                                                       OVERL417
C                                                                       OVERL418
C                                                                       OVERL419
      IF (ICORE.NE.0) GO TO 10                                          OVERL420
      ICORE=LOCF(A(1))+1                                                OVERL421
      GO TO 20                                                          OVERL422
   10 CONTINUE                                                          OVERL423
      NUMBP=NPERBM+1                                                    OVERL424
      LWIDTH=6                                                          OVERL425
      NA1=(NPERBM+1)*3                                                  OVERL426
      NA5=NA1+5                                                         OVERL427
      CALL FORT4 (NPERBM,NREADB,KSIG,KIN,KC,KMAT,KPS,NOBM,NNN,NBEAMX,NIXOVERL428
     1,NULAYB,NUMBP,LWIDTH,NA1,NA5,A(N1),A(N2),A(N3),A(N4),A(N5),A(N6),AOVERL429
     2(N7),A(N8),A(N9),A(N10),A(N11),A(N12),A(N13),A(N14),A(N15),A(N16),OVERL430
     3A(N17),A(N18),A(N19),A(N20),A(N21),A(N22),A(N23),A(N24),A(N25),A(NOVERL431
     426))                                                              OVERL432
   20 CONTINUE                                                          OVERL433
      END                                                               OVERL434
      SUBROUTINE FORT4 (NPERBM,NREADB,KSIG,KIN,KC,KMAT,KPS,NOBM,NNN,NBEAFORT4  2
     1MX,NIX,NULAYB,NUMBP,LWIDTH,NA1,NA5,SIG,DSIG,ESX,ESXC,ZCRDC,ASXLRC,FORT4  3
     2EPSPSC,AILRC,ITYPC,SIGXXA,ZCRD,ASXLR,EPSPS,AILR,ITYPE,TSHEAR,XLENCFORT4  4
     3,LILB,FORCE,TEMP,B,AK,X,Y,C,ALL)                                  FORT4  5
C                                                                       FORT4  6
C     THIS ROUTINE OBTAINS THE BEAM SOLUTIONS                           FORT4  7
C                                                                       FORT4  8
      COMMON /BDIM/ RON(6),ROM(6),EDOWN(6),STRAN(6),SIGO(6),FT(6),RONT(3FORT4  9
     1),ROMT(3),EDOWNT(3),EDOWNR(3)                                     FORT4 10
      COMMON /CB4/ IN,IO                                                FORT4 11
      COMMON /CB305/ PCTT,PCTC                                          FORT4 12
      COMMON /SCALED/ ISCALE,IFN                                        FORT4 13
      DIMENSION ESX(NULAYB,NBEAMX), SIG(NULAYB,NPERBM), DSIG(NULAYB,NPERFORT4 14
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     1BM), ESXC(NULAYB,NPERBM), ZCRDC(NULAYB,NPERBM), ASXLRC(NULAYB,NPERFORT4 15
     2BM), EPSPSC(NULAYB,NPERBM), AILRC(NULAYB,NPERBM), ITYPC(NULAYB,NPEFORT4 16
     3RBM), SIBXXA(NULAYB), ZCRD(NULAYB), ASXLR(NULAYB), EPSPS(NULAYB), FORT4 17
     4AILR(NULAYB), ITYPE(NULAYB), TSHEAR(NULAYB), XLENC(NPERBM), LILB(NFORT4 18
     5A1), FORCE(NA1), TEMP(NA1), B(NA1), AK(NA1,NA1), X(NA5), Y(NA5), CFORT4 19
     6(NA1), ALL(LWIDTH,NA1), DUMMY(1)                                  FORT4 20
C                                                                       FORT4 21
C                                                                       FORT4 22
      REWIND 3                                                          FORT4 23
      REWIND 4                                                          FORT4 24
      REWIND 5                                                          FORT4 25
      REWIND 15                                                         FORT4 26
      REWIND 25                                                         FORT4 27
      REWIND 27                                                         FORT4 28
      REWIND 33                                                         FORT4 29
      READ (33) ESX                                                     FORT4 30
      WRITE (IO,10)                                                     FORT4 31
   10 FORMAT (1H1,////,20X,*DEAD LOAD AND/OR PRESTRESS SOLUTION FOR INDIFORT4 32
     1VIDUAL BEAMS*,//)                                                 FORT4 33
C                                                                       FORT4 34
C                                                                       FORT4 35
      READ (IN,140) NSOLVB                                              FORT4 36
C                                                                       FORT4 37
      WRITE (IO,20) NSOLVB                                              FORT4 38
   20 FORMAT (1HO,//,20X,*NUMBER OF SOLUTION GROUPS =*,I5,///)          FORT4 39
      IF (NSOLVB.GT.NOBM) WRITE (IO,30)                                 FORT4 40
   30 FORMAT (1HO,//,6X,*NSOLVB IS GREATER THAN THE NUMBER OF BEAMS*,///FORT4 41
     1)                                                                 FORT4 42
      IF (NSOLVB.GT.NOBM) STOP 4                                        FORT4 43
C                                                                       FORT4 44
C     COMPUTE SOLUTIONS FOR NSOLVB GROUPS                               FORT4 45
C                                                                       FORT4 46
      NL=1                                                              FORT4 47
      NT=0                                                              FORT4 48
      NRB=0                                                             FORT4 49
C                                                                       FORT4 50
      DO 520 ITIMES=1,NSOLVB                                            FORT4 51
C                                                                       FORT4 52
      READ (IN,140) NSOLB                                               FORT4 53
      NT=NT+NSOLB                                                       FORT4 54
C                                                                       FORT4 55
      WRITE (IO,40) ITIMES,NSOLB,NL,NT                                  FORT4 56
   40 FORMAT (1HO,//,6X,*SOLUTION NUMBER = *,I5,/,6X,*NUMBER OF DUPLICATFORT4 57
     1E SOLUTIONS IN THIS GROUP =*,I5,/,6X,*STARTING BEAM = *,I5,* END BFORT4 58
     2EAM = *,I5,//)                                                    FORT4 59
C                                                                       FORT4 60
      IF (NT.GT.NOBM) WRITE (IO,50) NT,NOBM                             FORT4 61
   50 FORMAT (1HO,//,6X,*END BEAM -*,I5,*-  IS GREATER THAN TOTAL NUMBERFORT4 62
     1 OF BEAMS -*,I5,//)                                               FORT4 63
      IF (NT.GT.NOBM) STOP 4                                            FORT4 64
C                                                                       FORT4 65
      NSTART=NPERBM*(NT-1)+1                                            FORT4 66
C                                                                       FORT4 67
      IF (NRB.GE.NT) REWIND 3                                           FORT4 68
      IF (NRB.GE.NT) GO TO 90                                           FORT4 69
C                                                                       FORT4 70
C     READ NUMBER OF BEAMS IN THE INPUT GROUP                           FORT4 71
C                                                                       FORT4 72
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      READ (4) NB                                                       FORT4 73
      NTSOL=0                                                           FORT4 74
C                                                                       FORT4 75
C     FIND TOTAL NUMBER OF BEAMS INPUTTED                               FORT4 76
C                                                                       FORT4 77
      N=NRB+NB                                                          FORT4 78
      IF (NT.GT.N) WRITE (IO,60) NT,N                                   FORT4 79
   60 FORMAT (1HO,//,6X,*TOTAL NUMBER OF BEAM SOLUTIONS DESIRED =*,I5,* FORT4 80
     1IS GREATER THAN TOTAL NUMBER OF BEAMS INPUTTED AT THIS POINT =*,I5FORT4 81
     2,///)                                                             FORT4 82
      IF (NT.GT.N) WRITE (IO,70)                                        FORT4 83
   70 FORMAT (1HO,//,6X,*CHECK THE NUMBER OF DUPLICATE SOLUTIONS IN THE*FORT4 84
     1,/,6X,*SOLUTION GROUPS AGAINST THE DUPLICATE BEAMS IN THE BEAM *,/FORT4 85
     2,6X,*INPUT SECTION*,//)                                           FORT4 86
      IF (NT.GT.N) STOP 4                                               FORT4 87
C                                                                       FORT4 88
C     READ BOUNDARY CONDITIONS FOR THE BEAM GROUP                       FORT4 89
C                                                                       FORT4 90
      N=NPERBM+1                                                        FORT4 91
      DO 80 I=1,N                                                       FORT4 92
   80 READ (4) LILB(I*3-2),LILB(I*3-1),LILB(I*3)                        FORT4 93
C                                                                       FORT4 94
C                                                                       FORT4 95
   90 CONTINUE                                                          FORT4 96
C                                                                       FORT4 97
      NTSOL=NTSOL+NSOLB                                                 FORT4 98
      IF (NTSOL.GT.NB) WRITE (IO,100) NB,NTSOL                          FORT4 99
  100 FORMAT (1HO,//,6X,*NUMBER OF DUPLICATE BEAMS =*,I5,* IS LESS THAN*FORT4100
     1,/,6X,*THE NUMBER OF SOLUTIONS FOR THESE BEAMS =*,I5,///)         FORT4101
      IF (NTSOL.GT.NB) WRITE (IO,70)                                    FORT4102
      IF (NTSOL.GT.NB) STOP 4                                           FORT4103
C                                                                       FORT4104
      N=NPERBM+1                                                        FORT4105
      WRITE (IO,120)                                                    FORT4106
      WRITE (IO,130) (I,LILB(I*3-2),LILB(I*3-1),LILB(I*3),I=1,N)        FORT4107
C                                                                       FORT4108
C                                                                       FORT4109
C     ASSIGN LAYER PROPERTIES                                           FORT4110
C                                                                       FORT4111
      DO 110 II=1,NSOLB                                                 FORT4112
      DO 110 J=1,NPERBM                                                 FORT4113
      L=NSTART+J-1                                                      FORT4114
      READ (15) SIBXXA                                                  FORT4115
      READ (27) XLNGTH,GKEIX,NPIX,NPKX,ITYPE,ASXLR,AILR,ZCRD,TSHEAR     FORT4116
      XLENC(J)=XLNGTH                                                   FORT4117
      DO 110 I=1,NULAYB                                                 FORT4118
      ZCRDC(I,J)=ZCRD(I)                                                FORT4119
      ITYPC(I,J)=ITYPE(I)                                               FORT4120
      ASXLRC(I,J)=ASXLR(I)                                              FORT4121
      AILRC(I,J)=AILR(I)                                                FORT4122
      SIG(I,J)=SIBXXA(I)                                                FORT4123
      EPSPSC(I,J)=0.0                                                   FORT4124
      IF (ESX(I,L).NE.0.0) EPSPSC(I,J)=SIG(I,J)/ESX(I,L)                FORT4125
  110 ESXC(I,J)=ESX(I,L)                                                FORT4126
C                                                                       FORT4127
C                                                                       FORT4128
  120 FORMAT (1HO,//,20X,*BOUNDARY CONDITIONS*,//,6X,*NODAL POINT     U-DFORT4129
     1ISP       W-DISP      MY-DISP*,//)                               FORT4130
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  130 FORMAT (5X,I5,7X,I5,7X,I5,7X,I5)                                  FORT4131
C                                                                       FORT4132
C     READ NUMBER OF FORCE CARDS                                        FORT4133
C                                                                       FORT4134
      READ (IN,140) NFORCE                                              FORT4135
  140 FORMAT (I5)                                                       FORT4136
C                                                                       FORT4137
C     INITIALIZE                                                        FORT4138
C                                                                       FORT4139
      DO 150 I=1,NA1                                                    FORT4140
  150 FORCE(I)=0.                                                       FORT4141
C                                                                       FORT4142
      WRITE (IO,160) NFORCE                                             FORT4143
  160 FORMAT (1H0,//,6X,*NUMBER OF NODAL POINT FORCE CARDS = *,I3)      FORT4144
C                                                                       FORT4145
      IF (NFORCE.EQ.0) GO TO 220                                        FORT4146
C                                                                       FORT4147
C     READ FORCES                                                       FORT4148
C                                                                       FORT4149
      DO 170 I=1,NFORCE                                                 FORT4150
  170 READ (IN,180) J,FORCE(3*J-2),FORCE(3*J-1),FORCE(3*J)              FORT4151
  180 FORMAT (I5,5F10.0,25X)                                            FORT4152
      WRITE (IO,200)                                                    FORT4153
      WRITE (IO,210)                                                    FORT4154
      WRITE (IO,190) (M,FORCE(3*M-2),FORCE(3*M-1),FORCE(3*M),M=1,NUMBP) FORT4155
  190 FORMAT (1H ,5X,I5,2X,3F20.4)                                      FORT4156
  200 FORMAT (1H0,//,20X,*INPUTTED NODAL POINT FORCES ON INDIVIDUAL BEAMFORT4157
     1S (KIPS AND IN-KIPS)*,//)                                         FORT4158
  210 FORMAT (1H0,//,6X,*NODAL POINT*,10X,*U-LOAD*,14X,*W-LOAD*,13X,*MY-FORT4159
     1LOAD*,//)                                                         FORT4160
C                                                                       FORT4161
C                                                                       FORT4162
  220 CONTINUE                                                          FORT4163
C                                                                       FORT4164
C     READ THE UNIFORM AND CONCENTRATED LOADS                           FORT4165
C                                                                       FORT4166
      CALL BLOAD (NA1,NPERBM,XLENG,FORCE,IN,IO,NRB,NT)                  FORT4167
C                                                                       FORT4168
      WRITE (IO,230)                                                    FORT4169
      WRITE (IO,230)                                                    FORT4170
  230 FORMAT (1H )                                                      FORT4171
      WRITE (IO,240)                                                    FORT4172
  240 FORMAT (1H0,20X,*NODAL POINT FORCES INCLUDING SPECIFIED UNIFORM ANFORT4173
     1D CONCENTRATED LOADS*)                                            FORT4174
      WRITE (IO,210)                                                    FORT4175
      WRITE (IO,190) (M,FORCE(3*M-2),FORCE(3*M-1),FORCE(3*M),M=1,NUMBP) FORT4176
C                                                                       FORT4177
      KOUNT2=0                                                          FORT4178
      ICY=0                                                             FORT4179
      JACK=0                                                            FORT4180
      ICY=ICY+1                                                         FORT4181
      DO 250 I=1,NA1                                                    FORT4182
  250 TEMP(I)=0.                                                        FORT4183
  260 KODE=1                                                            FORT4184
      JACK=JACK+1                                                       FORT4185
C                                                                       FORT4186
      WRITE (IO,230)                                                    FORT4187
      WRITE (IO,270) JACK                                               FORT4188
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  270 FORMAT (1H0,5X,*ITERATION FOR BEAM SOLUTION = *,I3)                    FORT4189
C                                                                           FORT4190
C     GET BEAM STIFFNESS                                                    FORT4191
C                                                                           FORT4192
      CALL STIFF (NA1,NUMBP,AK,NULAYB,NPERBM,ASXLRC,ESXC,ZCRDC,AILRC,XLEFORT4193
     1NC,KODE)                                                              FORT4194
C                                                                           FORT4195
C     ENFORCE BOUNDARY CONDITIONS                                           FORT4196
C                                                                           FORT4197
      DO 290 KK=1,NA1                                                       FORT4198
      IF (LILB(KK)) 280,290,280                                             FORT4199
  280 FORCE(KK)=0.                                                          FORT4200
      AK(KK,KK)=1.0E30                                                      FORT4201
  290 CONTINUE                                                              FORT4202
C                                                                           FORT4203
C     SOLVE FORCE DISPLACEMENT EQUATIONS                                    FORT4204
C                                                                           FORT4205
      DO 300 I=1,NA1                                                        FORT4206
  300 B(I)=FORCE(I)                                                         FORT4207
      CALL SOLV2 (AK,9,NA1,NA5,X,AL1,Y,C)                                   FORT4208
C                                                                           FORT4209
C     GET STRAINS AND STRESSES                                              FORT4210
C                                                                           FORT4211
      DO 310 I=1,NPERBM                                                     FORT4212
      L=NSTART-1+I                                                          FORT4213
      EPS1=B(3*I+1)-B(3*I-2)                                                FORT4214
      EPS2=B(3*I+3)-B(3*I)                                                  FORT4215
      DO 310 J=1,NULAYB                                                     FORT4216
  310 DSIG(J,I)=((EPS1+EPS2*ZCRDC(J,I))*ESXC(J,I))/XLENC(I)                 FORT4217
C                                                                           FORT4218
C     CHECK CONVERGENCE                                                     FORT4219
C                                                                           FORT4220
      DO 320 I=1,NA1                                                        FORT4221
      IF (ABS(B(I)).LE..000000001) GO TO 320                                FORT4222
      IF (ABS((B(I)-TEMP(I))/B(I))-.01) 320,330,330                         FORT4223
  320 CONTINUE                                                              FORT4224
      GO TO 410                                                             FORT4225
C                                                                           FORT4226
C     CHECK SCALING LIMITS AND LAYER FAILURE                                FORT4227
C                                                                           FORT4228
  330 DO 370 I=1,NPERBM                                                     FORT4229
      L=NSTART+I-1                                                          FORT4230
      DO 370 J=1,NULAYB                                                     FORT4231
      K=ITYPC(J,I)                                                          FORT4232
      A=SIG(J,I)+DSIG(J,I)                                                  FORT4233
      IF (A.GT.0.0.AND.K.LE.KC) GO TO 340                                   FORT4234
      S=SIGO(K)                                                             FORT4235
      RM=ROM(K)                                                             FORT4236
      RN=RON(K)                                                             FORT4237
      GO TO 350                                                             FORT4238
  340 CONTINUE                                                              FORT4239
      S=FT(K)                                                               FORT4240
      RM=ROMT(K)                                                            FORT4241
      RN=RONT(K)                                                            FORT4242
  350 CONTINUE                                                              FORT4243
      IF (K.LE.KC.AND.ABS(A).GT.ABS(S)) ESX(J,L)=0.                         FORT4244
      E=ESX(J,L)                                                            FORT4245
      ESXC(J,I)=E/(1.0+RN*(1.0-RM)/RM*((ABS(A)/S)**(RN-1.0)))               FORT4246
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      RR=PCTC                                                          FORT4247
      IF (A.GT.0.0) RR=PCTT                                            FORT4248
      IF (K.GT.KC) RR=PCTT                                             FORT4249
      IF (ABS(A).GT.ABS(RR*S).AND.IFN.NE.3HYES) WRITE (IO,360)         FORT4250
  360 FORMAT (1H0,//,6X,*PCTC OR PCTT LIMITS EXCEEDED IN FORT4*,//)    FORT4251
      IF (ABS(A).GT.ABS(RR*S)) IFN=3HYES                               FORT4252
  370 CONTINUE                                                         FORT4253
      IF (JACK.LE.15) GO TO 390                                        FORT4254
      WRITE (IO,380)                                                   FORT4255
  380 FORMAT (1H0,//,5X,*NO CONVERGENCE*,//,5X*MAX NUMBER OF ITERATIONS FORT4256
     1ALLOWED = 15*)                                                   FORT4257
C                                                                      FORT4258
      STOP                                                             FORT4259
  390 CONTINUE                                                         FORT4260
      DO 400 I=1,NA1                                                   FORT4261
  400 TEMP(I)=B(I)                                                     FORT4262
C                                                                      FORT4263
C     DO ANOTHER ITERATION                                             FORT4264
C                                                                      FORT4265
      GO TO 260                                                        FORT4266
  410 CONTINUE                                                         FORT4267
C                                                                      FORT4268
C     END OF SOLUTION ROUTINE                                          FORT4269
C                                                                      FORT4270
      WRITE (IO,420)                                                   FORT4271
  420 FORMAT (1H0,//,20X,*NODAL POINT DISPLACEMENTS FOR THE BEAM*)     FORT4272
      WRITE (IO,430)                                                   FORT4273
  430 FORMAT (1H ,*-------------------------------------------------------FORT4274
     1-----------------------------------*)                           FORT4275
      WRITE (IO,490)                                                   FORT4276
      WRITE (IO,440) (B(I),I=1,NA1)                                    FORT4277
  440 FORMAT (1H ,6X,F9.5,12X,F9.5,12X,F9.5)                           FORT4278
      WRITE (IO,480)                                                   FORT4279
      DO 460 I=1,NPERBM                                                FORT4280
      EPS1=B(3*I+1)-B(3*I-2)                                           FORT4281
      EPS2=B(3*I+3)-B(3*I)                                             FORT4282
      L=NSTART-1+I                                                     FORT4283
      DO 450 J=1,NULAYB                                                FORT4284
      A=(EPS1+EPS2*ZCRDC(J,I))/XLENC(I)                                FORT4285
      A=A+EPSPSC(J,I)                                                  FORT4286
      EPSPS(J)=A                                                       FORT4287
      EPSPSC(J,I)=A                                                    FORT4288
      SIBXXA(J)=SIG(J,I)+DSIG(J,I)                                     FORT4289
      SIG(J,I)=SIBXXA(J)                                               FORT4290
  450 CONTINUE                                                         FORT4291
  460 CONTINUE                                                         FORT4292
      DO 470 I=1,NULAYB                                                FORT4293
  470 WRITE (IO,500) (SIG(I,J),J=1,NPERBM)                             FORT4294
C                                                                      FORT4295
  480 FORMAT (1H0,//,5X,*STRESSES (KSI) - ELEMENTS HORIZONTAL, LAYERS VEFORT4296
     1RTICAL*,//)                                                      FORT4297
  490 FORMAT (1H0,9X,*U-DISP (IN)          W-DISP (IN)          MY-DISP FORT4298
     1(RADIANS) *,//)                                                  FORT4299
  500 FORMAT (1H ,5X,14F9.4)                                           FORT4300
C                                                                      FORT4301
C     SET REMAINING BEAMS EQUAL TO LAST  BEAM SOLUTION                 FORT4302
C                                                                      FORT4303
C                                                                      FORT4304
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      DO 510 I=NL,NT                                                    FORT4305
      DO 51C J=1,NPERBM                                                 FORT4306
      WRITE (5) (SIG(L,J),L=1,NULAYB)                                   FORT4307
      WRITE (25) (EPSPSC(L,J),L=1,NULAYB)                               FORT4308
      KK=NSTART+J-1                                                     FORT4309
      K=(I-1)*NPERBM+J                                                  FORT4310
      DO 510 L=1,NULAYB                                                 FORT4311
      ESX(L,K)=ESX(L,KK)                                                FORT4312
  510 CONTINUE                                                          FORT4313
C                                                                       FORT4314
C                                                                       FORT4315
      IF (NT.EQ.NOBM) GO TO 530                                         FORT4316
      NL=NT+1                                                           FORT4317
      IF (NRB.LT.NT) NRB=NRB+NB                                         FORT4318
C                                                                       FORT4319
C     GO TO ANOTHER GROUP OF BEAMS                                      FORT4320
C                                                                       FORT4321
  520 CONTINUE                                                          FORT4322
C                                                                       FORT4323
C                                                                       FORT4324
  530 CONTINUE                                                          FORT4325
C                                                                       FORT4326
      REWIND 5                                                          FORT4327
      REWIND 15                                                         FORT4328
      CALL FINCOPY (4LJUM5,3LJ15,0)                                     FORT4329
      REWIND 33                                                         FORT4330
      WRITE (33) ESX                                                    FORT4331
C                                                                       FORT4332
      WRITE (IO,540)                                                    FORT4333
  540 FORMAT (1H0,//,9X,*INTERNAL MOMENTS (IN-KIPS) AND NORMAL FORCES (KFORT4334
     1IPS) IN BEAM ELEMENTS*,/,1H ,7X,*EL*,9X,*MB*,17X,*NB*,/)          FORT4335
C                                                                       FORT4336
      REWIND 15                                                         FORT4337
      REWIND 27                                                         FORT4338
C                                                                       FORT4339
      DO 570 I=1,NBEAMX                                                 FORT4340
      READ (15) SIBXXA                                                  FORT4341
      READ (27) XLNGTH,GKEIX,NPIX,NPKX,ITYPE,ASXLR,AILR,ZCRD,TSHEAR     FORT4342
      A=0.                                                              FORT4343
      S=0.                                                              FORT4344
C                                                                       FORT4345
      DO 550 J=1,NULAYB                                                 FORT4346
      A=A+SIBXXA(J)*ASXLR(J)*ZCRD(J)                                    FORT4347
      S=S+SIBXXA(J)*ASXLR(J)                                            FORT4348
  550 CONTINUE                                                          FORT4349
C                                                                       FORT4350
      WRITE (IO,560) I,A,S                                              FORT4351
  560 FORMAT (5X,I5,F15.4,3X,F15.4)                                     FORT4352
  570 CONTINUE                                                          FORT4353
C                                                                       FORT4354
      RETURN                                                            FORT4355
      END                                                               FORT4356
      SUBROUTINE BLOAD (NA1,NPERBM,XLENC,FORCE,IN,IO,NRB,NT)            BLOAD  2
C                                                                       BLOAD  3
C     THIS SUBROUTINE READS UNIFORM AND CONCENTRATED LOADS ON THE       BLOAD  4
C         BEAM                                                          BLOAD  5
C                                                                       BLOAD  6
      DIMENSION FORCE(NA1), XLENC(NPERBM)                               BLOAD  7
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C                                                                       BLOAD  8
C     READ THE UNIFORM LOAD                                             BLOAD  9
C                                                                       BLOAD 10
      WRITE (IO,10)                                                     BLOAD 11
   10 FORMAT (1H )                                                      BLOAD 12
      READ (IN,20) W                                                    BLOAD 13
   20 FORMAT (2F10.0)                                                   BLOAD 14
      WRITE (IO,30) W                                                   BLOAD 15
   30 FORMAT (1HO,5X,*UNIFORM LOAD ON BEAM*,14X,*=*,F9.4,* KIPS/IN*)    BLOAD 16
      IF (W.EQ.0.) GO TO 40                                             BLOAD 17
C                                                                       BLOAD 18
C     GET NODAL POINT FORCES                                            BLOAD 19
C                                                                       BLOAD 20
      CALL UNIFRM (FORCE,XLENC,W,NPERBM,NA1)                            BLOAD 21
   40 CONTINUE                                                          BLOAD 22
C                                                                       BLOAD 23
C     READ NUMBER OF CONCENTRATED LOAD CARDS                            BLOAD 24
C                                                                       BLOAD 25
      WRITE (IO,10)                                                     BLOAD 26
      READ (IN,50) NC                                                   BLOAD 27
   50 FORMAT (I5)                                                       BLOAD 28
      WRITE (IO,60) NC                                                  BLOAD 29
   60 FORMAT (1HO,5X,*NUMBER OF CONCENTRATED LOAD CARDS =*,I5)          BLOAD 30
      IF (NC.EQ.0) GO TO 100                                            BLOAD 31
      WRITE (IO,10)                                                     BLOAD 32
      WRITE (IO,70)                                                     BLOAD 33
   70 FORMAT (1HO,5X,*LOAD CARD   LOAD (KIPS)   POSITION (IN)*,//)      BLOAD 34
      DO 90 I=1,NC                                                      BLOAD 35
      READ (IN,20) P,X                                                  BLOAD 36
      WRITE (IO,80) I,P,X                                               BLOAD 37
   80 FORMAT (1H ,11X,I3,5X,F9.4,5X,F8.2)                               BLOAD 38
      CALL CONC (FORCE,XLENC,NPERBM,NA1,P,X,IO)                         BLOAD 39
   90 CONTINUE                                                          BLOAD 40
C                                                                       BLOAD 41
C     ADD PRESTRESS FORCES                                              BLOAD 42
C                                                                       BLOAD 43
  100 CONTINUE                                                          BLOAD 44
C                                                                       BLOAD 45
C     GET NODAL POINT FORCES                                            BLOAD 46
C                                                                       BLOAD 47
      IR=4                                                              BLOAD 48
      IF (NRB.GE.NT) IR=3                                               BLOAD 49
C                                                                       BLOAD 50
C     READ NUMBER OF PRESTRESS GROUPS (OR LAYERS)                       BLOAD 51
C                                                                       BLOAD 52
      READ (IR) NPS                                                     BLOAD 53
      IF (NRB.LT.NT) WRITE (3) NPS                                      BLOAD 54
      IF (NPS.EQ.0) GO TO 200                                           BLOAD 55
      WRITE (IO,110)                                                    BLOAD 56
  110 FORMAT (1HO,//,6X,*FORCES ON THE BEAM DUE TO PRESTRESS*)          BLOAD 57
      DO 160 JJ=1,NPS                                                   BLOAD 58
      WRITE (IO,10)                                                     BLOAD 59
      WRITE (IO,120) JJ                                                 BLOAD 60
  120 FORMAT (1HO,5X,*PRESTRESS GROUP*,I3)                              BLOAD 61
C                                                                       BLOAD 62
C     IDENTIFY SHAPE OF STRAND                                          BLOAD 63
C                                                                       BLOAD 64
      READ (IR) NAME,NC                                                 BLOAD 65
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      IF (NRB.LT.NT) WRITE (3) NAME,NC                                  BLOAD 66
      IF (NAME.EQ.5HPARAB) GO TO 130                                    BLOAD 67
      IF (NAME.EQ.5HSTRAI) GO TO 140                                    BLOAD 68
      GO TO 200                                                         BLOAD 69
  130 CONTINUE                                                          BLOAD 70
C                                                                       BLOAD 71
C     FOR PARABOLIC STRAND                                              BLOAD 72
C                                                                       BLOAD 73
      READ (IR) W                                                       BLOAD 74
      IF (NRB.LT.NT) WRITE (3) W                                        BLOAD 75
      WRITE (IO,30) W                                                   BLOAD 76
      CALL UNIFRM (FORCE,XLENC,W,NPERBM,NA1)                            BLOAD 77
      GO TO 160                                                         BLOAD 78
  140 CONTINUE                                                          BLOAD 79
C                                                                       BLOAD 80
C     FOR STRAIGHT LINE SEGMENTS                                        BLOAD 81
C                                                                       BLOAD 82
      WRITE (IO,60) NC                                                  BLOAD 83
      IF (NC.LE.0) GO TO 160                                            BLOAD 84
      WRITE (IO,70)                                                     BLOAD 85
      DO 150 I=1,NC                                                     BLOAD 86
      READ (IR) X,P                                                     BLOAD 87
      IF (NRB.LT.NT) WRITE (3) X,P                                      BLOAD 88
      WRITE (IO,80) I,P,X                                               BLOAD 89
      CALL CONC (FORCE,XLENC,NPERBM,NA1,P,X,IO)                         BLOAD 90
  150 CONTINUE                                                          BLOAD 91
  160 CONTINUE                                                          BLOAD 92
      READ (IR) NAME,NC                                                 BLOAD 93
      IF (NRB.LT.NT) WRITE (3) NAME,NC                                  BLOAD 94
      IF (NAME.EQ.5HEND  ) GO TO 170                                    BLOAD 95
      GO TO 200                                                         BLOAD 96
  170 CONTINUE                                                          BLOAD 97
C                                                                       BLOAD 98
C     END FORCES ON BEAM                                                BLOAD 99
C                                                                       BLOAD100
      WRITE (IO,10)                                                     BLOAD101
      WRITE (IO,180)                                                    BLOAD102
  180 FORMAT (1H0,5X,*END FORCES ON BEAM DUE TO PRESTRESS*,//,6X,*NODE  BLOAD103
     1 AXIAL LOAD(KIPS)    VERTICAL LOAD (KIPS)     MOMENT (IN-KIPS)*)   BLOAD104
      I=1                                                               BLOAD105
      READ (IR) P,W,X                                                   BLOAD106
      IF (NRB.LT.NT) WRITE (3) P,W,X                                    BLOAD107
      WRITE (IO,190) I,W,P,X                                            BLOAD108
  190 FORMAT (1H0,5X,I4,4X,F9.2,15X,F9.4,9X,F11.3)                      BLOAD109
      FORCE(I*3)=FORCE(I*3)+X                                           BLOAD110
      FORCE(I*3-1)=FORCE(I*3-1)+P                                       BLOAD111
      FORCE(I*3-2)=FORCE(I*3-2)+W                                       BLOAD112
      I=NPERBM+1                                                        BLOAD113
      READ (IR) P,W,X                                                   BLOAD114
      IF (NRB.LT.NT) WRITE (3) P,W,X                                    BLOAD115
      WRITE (IO,190) I,W,P,X                                            BLOAD116
      FORCE(I*3)=FORCE(I*3)+X                                           BLOAD117
      FORCE(I*3-1)=FORCE(I*3-1)+P                                       BLOAD118
      FORCE(I*3-2)=FORCE(I*3-2)+W                                       BLOAD119
  200 RETURN                                                            BLOAD120
      END                                                               BLOAD121
      SUBROUTINE CONC (FORCE,XLENC,NPERBM,NA1,P,X,IO)                   CONC   2
C                                                                       CONC   3
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C     THIS SUBROUTINE COMPUTES THE NODAL POINT FORCES FROM CONCENTRATED CONC    4
C         VERTICAL LOADS                                                CONC    5
C                                                                       CONC    6
      DIMENSION FORCE(NA1), XLENC(NPERBM)                               CONC    7
C                                                                       CONC    8
C     FIND LOADED ELEMENT                                               CONC    9
C                                                                       CONC   10
      DIST=0.                                                           CONC   11
      DO 10 J=1,NPERBM                                                  CONC   12
      DIST=DIST+XLENC(J)                                                CONC   13
      IF ((DIST+.001).GT.X) GO TO 30                                    CONC   14
   10 CONTINUE                                                          CONC   15
      WRITE (IO,20)                                                     CONC   16
   20 FORMAT (1H0,5X,20(1H*),*INCORRECT LOAD POSITION- ABORT FROM SUBROUCONC   17
     1TINE CONC*,//)                                                    CONC   18
      STOP 4                                                            CONC   19
   30 CONTINUE                                                          CONC   20
C                                                                       CONC   21
C     COMPUTE FIX END FORCES                                            CONC   22
C                                                                       CONC   23
      XL=XLENC(J)                                                       CONC   24
      B=DIST-X                                                          CONC   25
      A=XL-B                                                            CONC   26
      AM=P*A*B*B/XL/XL                                                  CONC   27
      BM=P*B*A*A/XL/XL                                                  CONC   28
      AV=P*B*B*(2.*A+XL)/XL/XL/XL                                       CONC   29
      BV=P*A*A*(2.0*B+XL)/XL/XL/XL                                      CONC   30
      FORCE(J*3)=FORCE(J*3)-AM                                          CONC   31
      FORCE(J*3+3)=FORCE(J*3+3)+BM                                      CONC   32
      FORCE(J*3-1)=FORCE(J*3-1)+AV                                      CONC   33
      FORCE(J*3+2)=FORCE(J*3+2)+BV                                      CONC   34
      RETURN                                                            CONC   35
      END                                                               CONC   36
      SUBROUTINE UNIFRM (FORCE,XLENC,W,NPERBM,NA1)                      UNIFRM  2
C                                                                       UNIFRM  3
C     THIS SUBROUTINE COMPUTES THE NODAL POINT FORCES FROM              UNIFRM  4
C          A UNIFORM LINE LOAD ON THE BEAM                              UNIFRM  5
C                                                                       UNIFRM  6
      DIMENSION FORCE(NA1), XLENC(NPERBM)                               UNIFRM  7
C                                                                       UNIFRM  8
      DO 10 I=1,NPERBM                                                  UNIFRM  9
      J=I+1                                                             UNIFRM 10
      XL=XLENC(I)                                                       UNIFRM 11
      FORCE(I*3)=FORCE(I*3)-W*XL*XL/12.                                 UNIFRM 12
      FORCE(J*3)=FORCE(J*3)+W*XL*XL/12.                                 UNIFRM 13
      FORCE(I*3-1)=FORCE(I*3-1)+W*XL/2.                                 UNIFRM 14
      FORCE(J*3-1)=FORCE(J*3-1)+W*XL/2.                                 UNIFRM 15
   10 CONTINUE                                                          UNIFRM 16
C                                                                       UNIFRM 17
      RETURN                                                            UNIFRM 18
      END                                                               UNIFRM 19
      SUBROUTINE STIFF (NA1,NUMNP,AK,NLAY,NPERBM,ASXLR,ESX,ZCRD,AILR,XLESTIFF  2
     1N,KODE)                                                           STIFF   3
C                                                                       STIFF   4
C     THIS SUBROUTINE COMPUTES THE STIFFNESS COEFFICIENTS FOR THE BEAM  STIFF   5
C                                                                       STIFF   6
      DIMENSION AK(NA1,NA1), XLEN(NPERBM), ASXLR(NLAY,NPERBM), ESX(NLAY,STIFF   7
     1NPERBM), ZCRD(NLAY,NPERBM), AILR(NLAY,NPERBM), ABAR(2), SBAR(2), ASTIFF  8
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```
     2IEAR(2)                                                          STIFF  9
  10 FORMAT (1H ,12F10.3)                                              STIFF 10
     KODE=1                                                            STIFF 11
C                                                                      STIFF 12
C    INITIALIZE STIFFNESS MATRIX.                                      STIFF 13
C                                                                      STIFF 14
     DO 20 I=1,NA1                                                     STIFF 15
     DO 20 J=1,NA1                                                     STIFF 16
  20 AK(I,J)=0.                                                        STIFF 17
C                                                                      STIFF 18
C    SET UP STIFFNESS COEFFICIENTS OF A NODE POINT BY CONSIDERING THAT STIFF 19
C    NODE POINT AND THE TWO ADJACENT NODES WITH SPECIAL PROVISION FOR  STIFF 20
C    FIRST AND LAST NODES.                                             STIFF 21
C                                                                      STIFF 22
     DO 170 J=1,NUMNP                                                  STIFF 23
     L=3*J                                                             STIFF 24
C                                                                      STIFF 25
C    INITIALIZE A SET OF LAYER PROPERTIES.                             STIFF 26
C                                                                      STIFF 27
     DO 30 JJ=1,2                                                      STIFF 28
     ABAR(JJ)=0.                                                       STIFF 29
     SBAR(JJ)=0.                                                       STIFF 30
  30 AIBAR(JJ)=0.                                                      STIFF 31
     JOE=1                                                             STIFF 32
  40 IF (JOE-3) 50,100,50                                              STIFF 33
  50 CONTINUE                                                          STIFF 34
     IF (J-1) 70,60,70                                                 STIFF 35
  60 JOE=2                                                             STIFF 36
  70 KK=J-2+JOE                                                        STIFF 37
C                                                                      STIFF 38
C   COMPUTE LAYER PROPERTIES..                                         STIFF 39
C                                                                      STIFF 40
     DO 80 I=1,NLAY                                                    STIFF 41
     ABAR(JOE)=ABAR(JOE)+ASXLR(I,KK)*ESX(I,KK)                         STIFF 42
     SBAR(JOE)=SBAR(JOE)+ASXLR(I,KK)*ZCRD(I,KK)*ESX(I,KK)              STIFF 43
  80 AIBAR(JOE)=AIBAR(JOE)+ASXLR(I,KK)*ZCRD(I,KK)**2*ESX(I,KK)+AILR(I,KSTIFF 44
    1K)*ESX(I,KK)                                                      STIFF 45
     ABAR(JOE)=ABAR(JOE)/XLEN(KK)                                      STIFF 46
     SBAR(JOE)=SBAR(JOE)/XLEN(KK)                                      STIFF 47
     AIBAR(JOE)=AIBAR(JOE)/XLEN(KK)                                    STIFF 48
     IF (J-NUMNP) 90,110,90                                            STIFF 49
  90 JOE=JOE+1                                                         STIFF 50
     GO TO 40                                                          STIFF 51
 100 CONTINUE                                                          STIFF 52
 110 CONTINUE                                                          STIFF 53
     IF (J-1) 130,120,130                                              STIFF 54
 120 GO TO 160                                                         STIFF 55
 130 IF (J-NUMNP) 150,140,150                                          STIFF 56
 140 KODE=2                                                            STIFF 57
C                                                                      STIFF 58
C    COMPUTE STIFFNESS COEFFICIENTS OF LAST NODE AND SKIP TO NO. 142,  STIFF 59
C    IF LAST NODE SKIP PART AFTER NUMBER 142.                          STIFF 60
C                                                                      STIFF 61
 150 AK(L-2,L-5)=-ABAR(1)                                              STIFF 62
     AK(L-2,L-3)=-SBAR(1)                                              STIFF 63
     AK(L-2,L-2)=ABAR(1)                                               STIFF 64
     AK(L-2,L)=SBAR(1)                                                 STIFF 65
     AK(L-1,L-4)=12.*AIBAR(1)/XLEN(J-1)/XLEN(J-1)*(-1.)                STIFF 66
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```
      AK(L-1,L-3)=6.*AIBAR(1)/XLEN(J-1)                                 STIFF 67
      AK(L-1,L-1)=-AK(L-1,L-4)                                          STIFF 68
      AK(L-1,L)=AK(L-1,L-3)                                             STIFF 69
      AK(L,L-5)=-SBAR(1)                                                STIFF 70
      AK(L,L-4)=-6.*AIBAR(1)/XLEN(J-1)                                  STIFF 71
      AK(L,L-3)=2.*AIBAR(1)                                             STIFF 72
      AK(L,L-2)=SBAR(1)                                                 STIFF 73
      AK(L,L-1)=-AK(L,L-4)                                              STIFF 74
      AK(L,L)=4.*AIBAR(1)                                               STIFF 75
      GO TO (160,170), KODE                                             STIFF 76
  160 AK(L-2,L-2)=AK(L-2,L-2)+ABAR(2)                                   STIFF 77
      AK(L-2,L)=AK(L-2,L)+SBAR(2)                                       STIFF 78
      AK(L-2,L+1)=-ABAR(2)                                              STIFF 79
      AK(L-2,L+3)=-SBAR(2)                                              STIFF 80
      AK(L-1,L-1)=AK(L-1,L-1)+12.*AIBAR(2)/(XLEN(J)**2)                 STIFF 81
      AK(L-1,L)=AK(L-1,L)-6.*AIBAR(2)/XLEN(J)                           STIFF 82
      AK(L-1,L+2)=-12.*AIBAR(2)/(XLEN(J)**2)                            STIFF 83
      AK(L-1,L+3)=-6.*AIBAR(2)/XLEN(J)                                  STIFF 84
      AK(L,L-2)=AK(L,L-2)+SBAR(2)                                       STIFF 85
      AK(L,L-1)=AK(L,L-1)-6.*AIBAR(2)/XLEN(J)                           STIFF 86
      AK(L,L)=AK(L,L)+4.*AIBAR(2)                                       STIFF 87
      AK(L,L+1)=-SBAR(2)                                                STIFF 88
      AK(L,L+2)=6.*AIBAR(2)/XLEN(J)                                     STIFF 89
      AK(L,L+3)=2.*AIBAR(2)                                             STIFF 90
  170 CONTINUE                                                          STIFF 91
      RETURN                                                            STIFF 92
      END                                                               STIFF 93
      SUBROUTINE SOLV2 (AK,B,NA1,NA5,X,ALL,Y,C)                         SOLV2  2
C                                                                       SOLV2  3
C     SOLVE FORCE DISPLACEMENT EQUATIONS USING CHOLESKI DECOMPOSITION   SOLV2  4
C                                                                       SOLV2  5
      DIMENSION AK(NA1,NA1), B(NA1), X(NA5), Y(NA5), C(NA1), ALL(6,NA1),SOLV2  6
     1 H(6), V(6), AL(6,5)                                              SOLV2  7
      NUMNP=NA1/3                                                       SOLV2  8
      NPSEGM=NUMNP                                                      SOLV2  9
      NIETE=5                                                           SOLV2 10
      ISEGM=1                                                           SOLV2 11
      LWIDTH=6                                                          SOLV2 12
      LAMA=NA1                                                          SOLV2 13
      DO 20 JA=1,NA1                                                    SOLV2 14
      DO 20 IA=1,LWIDTH                                                 SOLV2 15
      ALL(IA,JA)=0.                                                     SOLV2 16
      IF (JA+IA-1-NA1) 10,10,20                                         SOLV2 17
   10 ALL(IA,JA)=(AK(JA,JA+IA-1)+AK(JA+IA-1,JA))/2.                     SOLV2 18
   20 CONTINUE                                                          SOLV2 19
      DO 30 I=1,NA1                                                     SOLV2 20
   30 C(I)=B(I)                                                         SOLV2 21
C                                                                       SOLV2 22
C     ORIGINAL SOLV1 STARTS HERE W/O TAPES                              SOLV2 23
C     DECOMPOSITION INTO LOWER AND UPPER TRIANG.MATRIX                  SOLV2 24
C     AND GENERATION OF AUXILIARY VECTOR Y                              SOLV2 25
C                                                                       SOLV2 26
      L=LWIDTH                                                          SOLV2 27
      N=LAMA                                                            SOLV2 28
      DO 40 K=1,NIETE                                                   SOLV2 29
   40 Y(K)=0.                                                           SOLV2 30
      DO 50 J=1,NIETE                                                   SOLV2 31
      DO 50 I=1,L                                                       SOLV2 32
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```
      AL(I,J)=0.                                                        SOLV2 33
   50 CONTINUE                                                          SOLV2 34
      KOUNT=0                                                           SOLV2 35
      GO TO 70                                                          SOLV2 36
   60 IF (KZ2.EQ.NA1) GO TO 190                                         SOLV2 37
      KZ1=1+KOUNT*N                                                     SOLV2 38
      KZ2=NA1                                                           SOLV2 39
      GO TO 80                                                          SOLV2 40
   70 IF (KOUNT.GE.ISEGM) GO TO 60                                      SOLV2 41
      KZ1=1+KOUNT*N                                                     SOLV2 42
      KZ2=KZ1+N-1                                                       SOLV2 43
   80 CONTINUE                                                          SOLV2 44
      KZ3=0                                                             SOLV2 45
      DO 180 KZ=KZ1,KZ2                                                 SOLV2 46
      KZ3=KZ3+1                                                         SOLV2 47
      DO 90 I=1,L                                                       SOLV2 48
   90 V(I)=ALL(I,KZ3)                                                   SOLV2 49
      SUM=0.                                                            SOLV2 50
      DO 100 K=2,L                                                      SOLV2 51
      SUM=SUM+AL(K,L-K+1)**2                                            SOLV2 52
  100 CONTINUE                                                          SOLV2 53
      V(1)=1.0/SQRT(V(1)-SUM)                                           SOLV2 54
      NN=L-1                                                            SOLV2 55
      DO 120 M=2,NN                                                     SOLV2 56
      LM=M-1                                                            SOLV2 57
      MM=L-M                                                            SOLV2 58
      SUM=0.                                                            SOLV2 59
      DO 110 K=1,MM                                                     SOLV2 60
      SUM=SUM+AL(LM+K+1,L-K)*AL(K+1,L-K)                                SOLV2 61
  110 CONTINUE                                                          SOLV2 62
      V(M)=(V(M)-SUM)*V(1)                                              SOLV2 63
  120 CONTINUE                                                          SOLV2 64
      V(L)=V(L)*V(1)                                                    SOLV2 65
      DO 130 I=1,L                                                      SOLV2 66
  130 ALL(I,KZ3)=V(I)                                                   SOLV2 67
      DO 140 I=1,NIETE                                                  SOLV2 68
      K=L-I+1                                                           SOLV2 69
  140 H(I)=AL(K,I)                                                      SOLV2 70
      SUM=0.                                                            SOLV2 71
      DO 150 J=1,NIETE                                                  SOLV2 72
  150 SUM=SUM+H(J)*Y(J+KZ-1)                                            SOLV2 73
      Y(NIETE+KZ)=(C(KZ)-SUM)*V(1)                                      SOLV2 74
      NIETA=NIETE-1                                                     SOLV2 75
      DO 160 J=1,NIETA                                                  SOLV2 76
      DO 160 I=1,L                                                      SOLV2 77
      AL(I,J)=AL(I,J+1)                                                 SOLV2 78
  160 CONTINUE                                                          SOLV2 79
      DO 170 I=1,L                                                      SOLV2 80
      AL(I,NIETE)=V(I)                                                  SOLV2 81
  170 CONTINUE                                                          SOLV2 82
  180 CONTINUE                                                          SOLV2 83
      KOUNT=KOUNT+1                                                     SOLV2 84
      GO TO 70                                                          SOLV2 85
  190 DO 200 K=1,NA1                                                    SOLV2 86
  200 Y(K)=Y(K+L-1)                                                     SOLV2 87
C                                                                       SOLV2 88
C     GENERATION OF UNKNOWN VECTOR X.                                   SOLV2 89
C                                                                       SOLV2 90
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```
      NA=NA1+1                                                          SOLV2 91
      NB=L+NA1-1                                                        SOLV2 92
      DO 210 K=NA,NB                                                    SOLV2 93
  210 X(K)=0.                                                           SOLV2 94
      KOUNT=0                                                           SOLV2 95
      KZ2=0                                                             SOLV2 96
      KWP=NA1                                                           SOLV2 97
      IQUANT=ISEGM*NPSEGM-NUMNP                                         SOLV2 98
      IF (IQUANT) 220,230,230                                           SOLV2 99
  220 ISEGM=ISEGM+1                                                     SOLV2100
      IQUANT=ISEGM*NPSEGM-NUMNP                                         SOLV2101
      KZ1=1+3*IQUANT                                                    SOLV2102
      KZ2=N                                                             SOLV2103
      KZ3=3*IQUANT                                                      SOLV2104
      KWP=3*ISEGM*NPSEGM                                                SOLV2105
      GO TO 240                                                         SOLV2106
  230 IF (KZ2.GE.NA1) GO TO 280                                         SOLV2107
      KZ1=1+KOUNT*N                                                     SOLV2108
      KZ2=KZ1+N-1                                                       SOLV2109
      KZ3=0                                                             SOLV2110
  240 CONTINUE                                                          SOLV2111
      DO 270 KZ=KZ1,KZ2                                                 SOLV2112
      DO 250 I=1,L                                                      SOLV2113
  250 H(I)=ALL(I,N-KZ3)                                                 SOLV2114
      SUM=0.                                                            SOLV2115
      DO 260 J=2,L                                                      SOLV2116
  260 SUM=SUM+H(J)*X(KWP+J-KZ)                                          SOLV2117
      X(KWP-KZ+1)=(Y(KWP-KZ+1)-SUM)*H(1)                                SOLV2118
      KZ3=KZ3+1                                                         SOLV2119
  270 CONTINUE                                                          SOLV2120
      KOUNT=KOUNT+1                                                     SOLV2121
      GO TO 230                                                         SOLV2122
  280 CONTINUE                                                          SOLV2123
C                                                                       SOLV2124
C     ORIGINAL SOLV1 ENDS HERE                                          SOLV2125
C                                                                       SOLV2126
      DO 290 I=1,NA1                                                    SOLV2127
  290 B(I)=X(I)                                                         SOLV2128
      RETURN                                                            SOLV2129
      END                                                               SOLV2130
      OVERLAY  (ECCP,6,0)                                               OVERL6 2
      PROGRAM OVERL6                                                    OVERL6 3
C                                                                       OVERL6 4
C     THIS OVERLAY SETS UP DATA IN CORRECT ORDER FOR                    OVERL6 5
C          STIFFNESS MATRIX FORMULATION OF SLAB                         OVERL6 6
C                                                                       OVERL6 7
      COMMON /ITAPE/ IN,IO,I12,I22,I32                                  OVERL6 8
      COMMON /CB01/ NUMEL,NANA,NUMNP                                    OVERL6 9
      COMMON /ICORES/ ICR(5),ICCRE                                      OVERL610
      COMMON /CB4/ INN,IOO                                              OVERL611
      COMMON /ICOREL/ N7                                                OVERL612
      COMMON A(1)                                                       OVERL613
      N1=1                                                              OVERL614
      N2=N1+NUMEL*I12                                                   OVERL615
      N3=N2+NUMEL*I22                                                   OVERL616
      N4=N3+NUMEL*I32                                                   OVERL617
      N5=N4+I12                                                         OVERL618
      N6=N5+I22                                                         OVERL619
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      N7=N6+I32                                                         OVERL620
C                                                                       OVERL621
      IF (ICORE.NE.0) GO TO 10                                          OVERL622
      ICORE=LOCF(A(1))+1                                                OVERL623
      GO TO 20                                                          OVERL624
   10 CONTINUE                                                          OVERL625
      CALL TWRITE (IN,IO,NUMEL,NUMNP,NANA,I12,I22,I32,A(N1),A(N2),A(N3),OVERL626
     1A(N4),A(N5),A(N6))                                                OVERL627
   20 CONTINUE                                                          OVERL628
      END                                                               OVERL629
      SUBROUTINE TWRITE (IN,IO,NUMEL,NUMNP,NANA,I12,I22,I32,SXX,SYY,SXY,TWRITE 2
     1SXXOT,SYYOT,SXYOT)                                                TWRITE 3
C                                                                       TWRITE 4
C     THIS SUBROUTINE SETS UP DATA IN CORRECT ORDER FOR                 TWRITE 5
C         STIFFNESS MATRIX FORMULATION OF SLAB                          TWRITE 6
C                                                                       TWRITE 7
      DIMENSION SXX(NUMEL,I12), SYY(NUMEL,I22), SXY(NUMEL,I32), SXXOT(I1TWRITE 8
     12), SYYOT(I22), SXYOT(I32), NZ(4), DUM(1)                         TWRITE 9
C                                                                       TWRITE10
C     READ ARRAYS                                                       TWRITE11
C                                                                       TWRITE12
      REWIND IN                                                         TWRITE13
      REWIND IO                                                         TWRITE14
      DO 40 I=1,NUMEL                                                   TWRITE15
      READ (IN) SXXOT,SYYOT,SXYOT                                       TWRITE16
      DO 10 J=1,I12                                                     TWRITE17
      SXX(I,J)=SXXOT(J)                                                 TWRITE18
   10 CONTINUE                                                          TWRITE19
      DO 20 J=1,I22                                                     TWRITE20
      SYY(I,J)=SYYOT(J)                                                 TWRITE21
   20 CONTINUE                                                          TWRITE22
      DO 30 J=1,I32                                                     TWRITE23
      SXY(I,J)=SXYOT(J)                                                 TWRITE24
   30 CONTINUE                                                          TWRITE25
   40 CONTINUE                                                          TWRITE26
C                                                                       TWRITE27
C     REORDER AND WRITE TO TAPE                                         TWRITE28
C                                                                       TWRITE29
      REWIND 11                                                         TWRITE30
      DO 80 I=1,NUMNP                                                   TWRITE31
      READ (11) NZ(1),NZ(2),NZ(3),NZ(4),DUM,DUM,DUM,DUM,DUM,DUM,DUM,DUM,TWRITE32
     1DUM,DUM,DUM,DUM                                                   TWRITE33
      DO 80 NR=1,4                                                      TWRITE34
      N=NZ(NR)                                                          TWRITE35
      IF (N.EQ.NANA) GO TO 80                                           TWRITE36
      DO 50 J=1,I12                                                     TWRITE37
      SXXOT(J)=SXX(N,J)                                                 TWRITE38
   50 CONTINUE                                                          TWRITE39
      DO 60 J=1,I22                                                     TWRITE40
      SYYOT(J)=SYY(N,J)                                                 TWRITE41
   60 CONTINUE                                                          TWRITE42
      DO 70 J=1,I32                                                     TWRITE43
      SXYOT(J)=SXY(N,J)                                                 TWRITE44
   70 CONTINUE                                                          TWRITE45
      WRITE (IO) SXXOT,SYYOT,SXYOT                                      TWRITE46
   80 CONTINUE                                                          TWRITE47
C                                                                       TWRITE48
      RETURN                                                            TWRITE49
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      END                                                              TWRITE50
      OVERLAY  (ECCP,7,0)                                              OVERL7  2
      PROGRAM OVERL7                                                   OVERL7  3
C                                                                      OVERL7  4
C     THIS OVERLAY SETS UP DATA IN CORRECT ORDER FOR                   OVERL7  5
C         STIFFNESS MATRIX FORMULATION OF BEAM                         OVERL7  6
C                                                                      OVERL7  7
      COMMON /CB2/ NBEAMX,NIX,NULAYB                                   OVERL7  8
      COMMON /ITAPE/ IN,IC                                             OVERL7  9
      COMMON /CB01/ NUMEL,NANA,NUMNP                                   OVERL710
      COMMON /CB4/ INN,IOO                                             OVERL711
      COMMON /ICORES/ ICR(6),ICCRE                                     OVERL712
      COMMON /ICOREL/ N7,N3                                            OVERL713
      COMMON A(1)                                                      OVERL714
      N1=1                                                             OVERL715
      N2=N1+NULAYB*NBEAMX                                              OVERL716
      N3=N2+NULAYB                                                     OVERL717
C                                                                      OVERL718
      IF (ICORE.NE.0) GO TO 10                                         OVERL719
      ICORE=LOCF(A(1))+1                                               OVERL720
      GO TO 20                                                         OVERL721
   10 CONTINUE                                                         OVERL722
      CALL TWRB (IN,IO,NULAYB,NBEAMX,NIX,NUMNP,A(N1),A(N2))            OVERL723
C                                                                      OVERL724
   20 CONTINUE                                                         OVERL725
C                                                                      OVERL726
      END                                                              OVERL727
      SUBROUTINE TWRB (IN,IO,NULAYB,NBEAMX,NIX,NUMNP,SXX,SIBXXA)       TWRB    2
C                                                                      TWRB    3
C     THIS SUBROUTINE SETS UP DATA IN CORRECT ORDER FOR                TWRB    4
C         STIFFNESS FORMULATION OF BEAM                                TWRB    5
C                                                                      TWRB    6
      DIMENSION SXX(NULAYB,NBEAMX), SIBXXA(NULAYB), NZ(2)              TWRB    7
      REWIND IN                                                        TWRB    8
      REWIND IO                                                        TWRB    9
      REWIND 13                                                        TWRB   10
      DO 10 J=1,NBEAMX                                                 TWRB   11
      READ (IN) SIBXXA                                                 TWRB   12
      DO 10 I=1,NULAYB                                                 TWRB   13
      SXX(I,J)=SIBXXA(I)                                               TWRB   14
   10 CONTINUE                                                         TWRB   15
      DO 30 I=1,NUMNP                                                  TWRB   16
      READ (13) NPARX,NZ(1),NZ(2),NPIX,NPKX                            TWRB   17
      DO 30 NR=1,2                                                     TWRB   18
      IF (NPARX.EQ.0) GO TO 30                                         TWRB   19
      N=NZ(NR)                                                         TWRB   20
      IF (N.EQ.NIX) GO TO 30                                           TWRB   21
      DO 20 J=1,NULAYB                                                 TWRB   22
      SIBXXA(J)=SXX(J,N)                                               TWRB   23
   20 CONTINUE                                                         TWRB   24
      WRITE (IO) SIBXXA                                                TWRB   25
   30 CONTINUE                                                         TWRB   26
      RETURN                                                           TWRB   27
      END                                                              TWRB   28
      OVERLAY  (ECCP,11,0)                                             OVERL9  2
      PROGRAM OVERL9                                                   OVERL9  3
C                                                                      OVERL9  4
C     THIS OVERLAY SETS UP LOCATIONS FOR DYNAMIC STORAGE               OVERL9  5
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C          REQUIREMENTS                                                  OVERL9 6
C                                                                        OVERL9 7
      COMMON /OV1/ AA(16)                                                OVERL9 8
      COMMON /OV2/ BB(21)                                                OVERL9 9
      COMMON /OV3/ CC(10)                                                OVERL910
      COMMON /OV4/ DD(26)                                                OVERL911
      COMMON /OV5/ EE(52)                                                OVERL912
      COMMON /OV10/ GG(13)                                               OVERL913
      COMMON /OV8/ FF(29)                                                OVERL914
      COMMON /OVER1/ A(17)                                               OVERL915
      COMMON /OVER2/ B(22)                                               OVERL916
      COMMON /OVER3/ C(11)                                               OVERL917
      COMMON /OVER4/ D(27)                                               OVERL918
      COMMON /OVER5/ E(53)                                               OVERL919
      COMMON /OVER10/ G(14)                                              OVERL920
      COMMON /OVER8/ F(30)                                               OVERL921
      COMMON /CB01/ NUMEL,NANA,NUMNP,NETA,NA1,NULAY,NSLAYR,NCNS          OVERL922
      COMMON /CB2/ NBEAMX,NIX,NULAYB                                     OVERL923
      COMMON /CB3/ LWIDTH,NITA,NPSEGM                                    OVERL924
      COMMON /CB300/ NPERBM,NREADB,KSIG,KIN,KC,KMAT,KPS,NCBM,NNN         OVERL925
      COMMON /CB310/ NELX,NSMAT,NELY                                     OVERL926
      COMMON /ICORES/ ICR(8),ICCRE                                       OVERL927
      COMMON // BLANK(1)                                                 OVERL928
      INTEGER A,B,C,D,E,F                                                OVERL929
      INTEGER AA,BB,CC,DD,EE,FF                                          OVERL930
      INTEGER G,GG                                                       OVERL931
C                                                                        OVERL932
      ICORE=LOCF(BLANK(1))+1                                             OVERL933
C                                                                        OVERL934
      NA=16                                                              OVERL935
      NB=21                                                              OVERL936
      NC=10                                                              OVERL937
      ND=26                                                              OVERL938
      NE=52                                                              OVERL939
      NF=29                                                              OVERL940
      NG=13                                                              OVERL941
      NPA=NA+1                                                           OVERL942
      NPB=NB+1                                                           OVERL943
      NPC=NC+1                                                           OVERL944
      NPD=ND+1                                                           OVERL945
      NPE=NE+1                                                           OVERL946
      NPF=NF+1                                                           OVERL947
      NPG=NG+1                                                           OVERL948
      NUMEL=NELX*NELY                                                    OVERL949
      NITA=0                                                             OVERL950
      NCNS=NULAY+NSLAYR                                                  OVERL951
      NPERBM=NELX                                                        OVERL952
      NANA=NUMEL+1                                                       OVERL953
      NUMNP=(NELX+1)*(NELY+1)                                            OVERL954
      NETA=NUMNP+1                                                       OVERL955
      NA1=5*NUMNP                                                        OVERL956
      NIX=NBEAMX+1                                                       OVERL957
      LWIDTH=(NELX+3)*5                                                  OVERL958
      LAMA=NPSEGM*5                                                      OVERL959
      NIETE=LWIDTH-1                                                     OVERL960
      NA5=NA1+LWIDTH-1                                                   OVERL961
      NUMBP=NELX+1                                                       OVERL962
      LWDTHB=6                                                           OVERL963
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      NA1B=3*(NELX+1)                                                   OVERL964
      NA5B=NA1B+5                                                       OVERL965
      NOBM=NBEAMX/NELX                                                  OVERL966
      NNN=NOBM*(NELX+1)*3                                               OVERL967
C                                                                       OVERL968
C     FIND ARRAY LENGTHS FOR EACH OVERLAY                               OVERL969
C                                                                       OVERL970
      CALL VV1 (LAMA,NA5,NIETE,NUMBP,NA1B,NA5B,LWDTHB)                  OVERL971
      CALL VV2 (LAMA,NA5,NIETE,NUMBP,NA1B,NA5B,LWDTHB)                  OVERL972
      CALL VV3 (LAMA,NA5,NIETE,NUMBP,NA1B,NA5B,LWDTHB)                  OVERL973
      CALL VV4 (NA1B,NA5B,LWDTHB)                                       OVERL974
      CALL VV5 (LAMA,NA5,NIETE,NUMBP,NA1B,NA5B,LWDTHB)                  OVERL975
      CALL VV8                                                          OVERL976
      CALL VV10                                                         OVERL977
C                                                                       OVERL978
C     SET UP ARRAY LOCATIONS                                            OVERL979
C                                                                       OVERL980
      CALL DIM (AA,NA,A,NPA)                                            OVERL981
      CALL DIM (BB,NB,B,NPB)                                            OVERL982
      CALL DIM (CC,NC,C,NPC)                                            OVERL983
      CALL DIM (DD,ND,D,NPD)                                            OVERL984
      CALL DIM (EE,NE,E,NPE)                                            OVERL985
      CALL DIM (FF,NF,F,NPF)                                            OVERL986
      CALL DIM (GG,NG,G,NPG)                                            OVERL987
      END                                                               OVERL988
      SUBROUTINE DIM (AA,NA,A,NPA)                                      DIM    2
      INTEGER A,AA                                                      DIM    3
      DIMENSION AA(NA), A(NPA)                                          DIM    4
      A(1)=1                                                            DIM    5
      DO 10 I=2,NPA                                                     DIM    6
      A(I)=A(I-1)+AA(I-1)                                               DIM    7
   10 CONTINUE                                                          DIM    8
      RETURN                                                            DIM    9
      END                                                               DIM   10
      SUBROUTINE VV5 (LAMA,NA5,NIETE,NUMBP,NA1B,NA5B,LWDTHB)            VV5    2
      COMMON /CB01/ NUMEL,NANA,NUMNP,NETA,NA1,NULAY,NSLAYR,NCNS         VV5    3
      COMMON /CB2/ NBEAMX,NIX,NULAYB                                    VV5    4
      COMMON /CB310/ NELX,NSMAT,NELY                                    VV5    5
      COMMON /OV5/ FORCE,LILA,FORCEA,DISPLA,DISP,DISPO,FORCEB,FCADD,FCSAVV5    6
     1DD,CTXX,CTYY,CTXY,ETXX,ETYY,ETXY,CUXX,CUYY,CUXY,EIXX,EIYY,EIXY,AS1VV5    7
     2,AF,AS,SIGXXO,SIGYYO,SIGXYO,SXXOT,SYYOT,SXYOT,EXTRA,EXTRA1,EXTRA2,VV5    8
     3EXTRA3,EXTRA4,EXTRA5,EXTRA6,EXTRA7,EIB,CUB,DUM,EPSPS,SIBXXA,SIBXXCVV5    9
     4,ASXLR,AILR,ZCRD,TSHEAR,ITYPE,ESX,AFT,AST                         VV5   10
      INTEGER FORCE,LILA,FORCEA,DISPLA,DISP,DISPO,FORCEB,FCADD,FCSADD,CTVV5   11
     1XX,CTYY,CTXY,ETXX,ETYY,ETXY,CUXX,CUYY,CUXY,EIXX,EIYY,EIXY,AS1,AF,AVV5   12
     2S,SIGXXO,SIGYYO,SIGXYO,SXXOT,SYYOT,SXYOT,EXTRA,EXTRA1,EXTRA2,EXTRAVV5   13
     33,EXTRA4,EXTRA5,EXTRA6,EXTRA7,EIB,CUB,DUM,EPSPS,SIBXXA,SIBXXC,ASXLVV5   14
     4R,AILR,ZCRD,TSHEAR,ITYPE,ESX,AFT,AST                              VV5   15
C                                                                       VV5   16
      FORCE=NA1                                                         VV5   17
      LILA=NA1                                                          VV5   18
      FORCEA=NA1                                                        VV5   19
      DISPLA=NA1                                                        VV5   20
      DISP=NA1                                                          VV5   21
      DISPO=NA1                                                         VV5   22
      FORCEB=NA1                                                        VV5   23
      FCADD=NA1                                                         VV5   24
      FCSADD=NA1                                                        VV5   25
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      CTXX=NUMEL                                                        VV5   26
      CTYY=NUMEL                                                        VV5   27
      CTXY=NUMEL                                                        VV5   28
      ETXX=NUMEL                                                        VV5   29
      ETYY=NUMEL                                                        VV5   30
      ETXY=NUMEL                                                        VV5   31
      CUXX=NUMEL                                                        VV5   32
      CUYY=NUMEL                                                        VV5   33
      CUXY=NUMEL                                                        VV5   34
      EIXX=NUMEL                                                        VV5   35
      EIYY=NUMEL                                                        VV5   36
      EIXY=NUMEL                                                        VV5   37
      AS1=NUMEL*NCNS                                                    VV5   38
      AF=NUMEL*NULAY                                                    VV5   39
      AS=AF                                                             VV5   40
      SIGXXO=NCNS                                                       VV5   41
      SIGYYO=NCNS                                                       VV5   42
      SIGXYO=NCNS                                                       VV5   43
      SXXOT=NCNS                                                        VV5   44
      SYYOT=NCNS                                                        VV5   45
      SXYOT=NCNS                                                        VV5   46
      NE3=3                                                             VV5   47
      EXTRA=NE3                                                         VV5   48
      EXTRA1=NE3*NULAYB                                                 VV5   49
      EXTRA2=EXTRA1                                                     VV5   50
      EXTRA4=EXTRA1                                                     VV5   51
      EXTRA5=EXTRA1                                                     VV5   52
      EXTRA6=EXTRA1                                                     VV5   53
      EXTRA3=NULAYB                                                     VV5   54
      EXTRA7=NULAYB                                                     VV5   55
      EIB=NBEAMX                                                        VV5   56
      CUB=NBEAMX                                                        VV5   57
      EPSPS=NULAYB                                                      VV5   58
      DUM=NULAYB                                                        VV5   59
      SIBXXA=NULAYB                                                     VV5   60
      SIBXXC=NULAYB                                                     VV5   61
      ASXLR=NULAYB                                                      VV5   62
      AILR=NULAYB                                                       VV5   63
      ZCRD=NULAYB                                                       VV5   64
      TSHEAR=NULAYB                                                     VV5   65
      ITYPE=NULAYB                                                      VV5   66
      ESX=NULAYB*NBEAMX                                                 VV5   67
      AFT=NCNS                                                          VV5   68
      AST=NCNS                                                          VV5   69
C                                                                       VV5   70
      RETURN                                                            VV5   71
      END                                                               VV5   72
      SUBROUTINE VV1 (LAMA,NA5,NIETE,NUMBP,NA1B,NA5B,LWDTHB)            VV1    2
      COMMON /CB01/ NUMEL,NANA,NUMNP,NETA,NA1,NULAY,NSLAYR,NCNS         VV1    3
      COMMON /CB310/ NELX,NSMAT,NELY                                    VV1    4
      COMMON /OV1/ NPI,NPJ,NPK,NPL,ELLA,ELLB,NEQ1,NEQ2,NEQ3,NEQ4,DT,Q,FOVV1    5
     1RCE,LILA,XSEG,YSEG                                                VV1    6
      INTEGER NPI,NPJ,NPK,NPL,ELLA,ELLB,NEQ1,NEQ2,NEQ3,NEQ4,DT,Q,FORCE,LVV1    7
     1ILA,XSEG,YSEG                                                     VV1    8
C                                                                       VV1    9
      NPI=NANA                                                          VV1   10
      NPJ=NANA                                                          VV1   11
      NPK=NANA                                                          VV1   12
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      NPL=NANA                                                          VV1   13
      ELLA=NUMEL                                                        VV1   14
      ELLB=NUMEL                                                        VV1   15
      NEQ1=NUMNP                                                        VV1   16
      NEQ2=NUMNP                                                        VV1   17
      NEQ3=NUMNP                                                        VV1   18
      NEQ4=NUMNP                                                        VV1   19
      DT=NUMEL                                                          VV1   20
      Q=NUMEL                                                           VV1   21
      FORCE=NA1                                                         VV1   22
      LILA=NA1                                                          VV1   23
      XSEG=NELX                                                         VV1   24
      YSEG=NELY                                                         VV1   25
C                                                                       VV1   26
      RETURN                                                            VV1   27
      END                                                               VV1   28
      SUBROUTINE VV8                                                    VV8    2
      COMMON /C801/ NUMEL,NANA,NUMNP,NETA,NA1,NULAY,NSLAYR,NCNS         VV8    3
      COMMON /C82/ NBEAMX,NIX,NULAYB,NULAYR,NULAYE,NR,NRE               VV8    4
      COMMON /C8310/ NELX,NSMAT,NELY                                    VV8    5
      COMMON /C8300/ NPERBM,NREADB,KSIG,KIN,KC,KMAT,KPS,NCBM,NNN        VV8    6
      COMMON /OV8/ NPARX,NXL,NXR,GKEIX,NPIX,NPKX,SIBXXA,PA,PB,XSEG,YSEG,VV8    7
     1B,T,ITR,SIR,D,CGTB,PGTE,BE,TE,SE,ITE,CGTE,ASXLR,AILR,ZCRD,TSHEAR,EVV8    8
     2SX,ITYPE                                                          VV8    9
      INTEGER NPARX,NXL,NXR,GKEIX,NPIX,NPKX,SIBXXA,PA,PB,XSEG,YSEG,B,T,IVV8   10
     1TR,SIR,D,CGTB,PGTE,BE,TE,SE,ITE,CGTE,ASXLR,AILR,ZCRD,TSHEAR,ESX,ITVV8   11
     2YPE                                                               VV8   12
C                                                                       VV8   13
      NPARX=NUMNP                                                       VV8   14
      NXL=NUMNP                                                         VV8   15
      NXR=NUMNP                                                         VV8   16
      NPIX=NIX                                                          VV8   17
      NPKX=NIX                                                          VV8   18
      ESX=NULAYB*NBEAMX                                                 VV8   19
      PA=NRE                                                            VV8   20
      PB=NRE                                                            VV8   21
      GKEIX=NPERBM                                                      VV8   22
      SIBXXA=NULAYB*NPERBM                                              VV8   23
      ASXLR=SIBXXA                                                      VV8   24
      AILR=SIBXXA                                                       VV8   25
      ZCRD=SIBXXA                                                       VV8   26
      TSHEAR=SIBXXA                                                     VV8   27
      ITYPE=SIBXXA                                                      VV8   28
      B=NRE*NR                                                          VV8   29
      T=B                                                               VV8   30
      ITR=B                                                             VV8   31
      SIR=B                                                             VV8   32
      D=NR                                                              VV8   33
      CGTB=NR                                                           VV8   34
      PGTE=NPERBM                                                       VV8   35
      CGTE=NPERBM                                                       VV8   36
      TE=NPERBM*NRE                                                     VV8   37
      BE=TE                                                             VV8   38
      SE=TE                                                             VV8   39
      ITE=TE                                                            VV8   40
      XSEG=NELX                                                         VV8   41
      YSEG=NELY                                                         VV8   42
C                                                                       VV8   43
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      RETURN                                                            VV8    44
      END                                                               VV8    45
      SUBROUTINE VV2 (LAMA,NA5,NIETE,NUMBP,NA1B,NA5B,LWDTHB)            VV2     2
      COMMON /CB01/ NUMEL,NANA,NUMNP,NETA,NA1,NULAY,NSLAYR,NCNS         VV2     3
      COMMON /CB2/ NBEAMX,NIX,NULAYB                                    VV2     4
      COMMON /CB3/ LWIDTH,NITA,NPSEGM                                   VV2     5
      COMMON /OV2/ FORCE,LILA,AS1,AF,AS,SIGXXO,SIGYYO,SIGXYO,SXXOT,SYYOTVV2     6
     1,SXYOT,ALL,OVK,SIBXXA,SIBXXC,ASXLR,AILR,ZCRD,TSHEAR,ITYPE,ESX     VV2     7
      INTEGER FORCE,LILA,AS1,AF,AS,SIGXXO,SIGYYO,SIGXYC,SXXOT,SYYOT,SXYOVV2     8
     1T,ALL,OVK,SIBXXA,SIBXXC,ASXLR,AILR,ZCRD,TSHEAR,ITYPE,ESX          VV2     9
C                                                                       VV2    10
      FORCE=NA1                                                         VV2    11
      LILA=NA1                                                          VV2    12
      AS1=NUMEL*NCNS                                                    VV2    13
      AF=NUMEL*NULAY                                                    VV2    14
      AS=AF                                                             VV2    15
      SIGXXO=NCNS                                                       VV2    16
      SIGYYO=NCNS                                                       VV2    17
      SIGXYO=NCNS                                                       VV2    18
      SXXOT=NCNS                                                        VV2    19
      SYYOT=NCNS                                                        VV2    20
      SXYOT=NCNS                                                        VV2    21
      ALL=LWIDTH*LAMA                                                   VV2    22
      OVK=5*NA5                                                         VV2    23
      SIBXXA=NULAYB                                                     VV2    24
      SIBXXC=NULAYB                                                     VV2    25
      ASXLR =NULAYB                                                     VV2    26
      AILR  =NULAYB                                                     VV2    27
      ZCRD  =NULAYB                                                     VV2    28
      TSHEAR=NULAYB                                                     VV2    29
      ITYPE =NULAYB                                                     VV2    30
      ESX=NULAYB*NBEAMX                                                 VV2    31
C                                                                       VV2    32
      RETURN                                                            VV2    33
      END                                                               VV2    34
      SUBROUTINE VV3 (LAMA,NA5,NIETE,NUMBP,NA1B,NA5B,LWDTHB)            VV3     2
      COMMON /CB01/ NUMEL,NANA,NUMNP,NETA,NA1,NULAY,NSLAYR,NCNS         VV3     3
      COMMON /CB3/ LWIDTH,NITA,NPSEGM                                   VV3     4
      COMMON /OV3/ C,X,Y,ALL,AL,H,V,FORCE,LILA,DISP                     VV3     5
      INTEGER C,X,Y,ALL,AL,H,V,FORCE,LILA,DISP                          VV3     6
C                                                                       VV3     7
      C=NA1                                                             VV3     8
      FORCE=NA1                                                         VV3     9
      DISP=NA1                                                          VV3    10
      LILA=NA1                                                          VV3    11
      X=NA5                                                             VV3    12
      Y=NA5                                                             VV3    13
      H=LWIDTH                                                          VV3    14
      V=LWIDTH                                                          VV3    15
      AL=LWIDTH*NIETE                                                   VV3    16
      ALL=LWIDTH*LAMA                                                   VV3    17
C                                                                       VV3    18
      RETURN                                                            VV3    19
      END                                                               VV3    20
      SUBROUTINE VV4 (NA1B,NA5B,LWDTHB)                                 VV4     2
      COMMON /CB2/ NBEAMX,NIX,NULAYB                                    VV4     3
      COMMON /CB300/ NPERBM,NREADB,KSIG,KIN,KC,KMAT,KPS,NOBM,NNN        VV4     4
      COMMON /OV4/ SIG,DSIG,ESX,ESXC,ZCRDC,ASXLRC,EPSPSC,AILRC,ITYPC,SIPVV4     5
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     1XXA,ZCRD,ASXLR,EPSPS,AILR,ITYPE,TSHEAR,XLENC,LILB,FORCE4,TEMP,B,AKVV4     6
     2,XB,YB,CB,ALLB                                                  VV4     7
      INTEGER SIG,DSIG,ESX,ESXC,ZCRDC,ASXLRC,EPSPSC,AILRC,ITYPC,SIBXXA,ZVV4     8
     1CRD,ASXLR,EPSPS,AILR,ITYPE,TSHEAR,XLENC,LILB,FORCE4,TEMP,B,AK,XB,YVV4     9
     2B,CB,ALLB                                                        VV4    10
C                                                                      VV4    11
      SIG=NULAYB*NPERBM                                                VV4    12
      DSIG=SIG                                                         VV4    13
      ESX=NULAYB*NBEAMX                                                VV4    14
      ESXC=SIG                                                         VV4    15
      ZCRDC=SIG                                                        VV4    16
      ASXLRC=SIG                                                       VV4    17
      EPSPSC=SIG                                                       VV4    18
      AILRC=SIG                                                        VV4    19
      ITYPC=SIG                                                        VV4    20
      SIBXXA=NULAYB                                                    VV4    21
      ASXLR =NULAYB                                                    VV4    22
      AILR  =NULAYB                                                    VV4    23
      ZCRD  =NULAYB                                                    VV4    24
      TSHEAR=NULAYB                                                    VV4    25
      ITYPE =NULAYB                                                    VV4    26
      EPSPS=NULAYB                                                     VV4    27
      XLENC=NPERBM                                                     VV4    28
      LILB=NA1B                                                        VV4    29
      FORCE4=NA1B                                                      VV4    30
      TEMP=NA1B                                                        VV4    31
      B=NA1B                                                           VV4    32
      AK=NA1B*NA1B                                                     VV4    33
      CB=NA1B                                                          VV4    34
      XB=NA5B                                                          VV4    35
      YB=NA5B                                                          VV4    36
      ALLB=LWDTHB*NA1B                                                 VV4    37
C                                                                      VV4    38
      RETURN                                                           VV4    39
      END                                                              VV4    40
      SUBROUTINE VV10                                                  VV10    2
      COMMON /CB01/ NUMEL,NANA,NUMNP,NETA,NA1,NULAY,NSLAYR,NCNS        VV10    3
      COMMON /CB2/ NBEAMX,NIX,NULAYB                                   VV10    4
      COMMON /CB310/ NELX,NSMAT,NELY                                   VV10    5
      COMMON /OV10/ ESX,SIBXXA,ITYPE,DUM,EXTRA,EXTRA1,EXTRA2,EXTRA3,AS1,VV10    6
     1AFT,AST,XSEG,YSEG                                                VV10    7
      INTEGER ESX,SIBXXA,ITYPE,DUM,EXTRA,EXTRA1,EXTRA2,EXTRA3,AS1,AFT,ASVV10    8
     1T,XSEG,YSEG                                                      VV10    9
C                                                                      VV10   10
      ESX=NULAYB*NBEAMX                                                VV10   11
      SIBXXA=NULAYB                                                    VV10   12
      ITYPE =NULAYB                                                    VV10   13
      DUM   =NULAYB                                                    VV10   14
      EXTRA=NELX                                                       VV10   15
      EXTRA1=NULAYB*NELX                                               VV10   16
      EXTRA2=EXTRA1                                                    VV10   17
      EXTRA3=EXTRA1                                                    VV10   18
      AS1=NUMEL*NCNS                                                   VV10   19
      AST=NCNS                                                         VV10   20
      AFT=NCNS                                                         VV10   21
      XSEG=NELX                                                        VV10   22
      YSEG=NELY                                                        VV10   23
      RETURN                                                           VV10   24
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      END                                                                VV10  25
      OVERLAY  (ECCP,12,0)                                               OVRL10  2
      PROGRAM OVRL10                                                     OVRL10  3
C                                                                        OVRL10  4
C     THIS OVERLAY DOES THE PRINTER PLOTS FOR THE BEAMS AND SLAB         OVRL10  5
C                                                                        OVRL10  6
      COMMON /CB01/ NUMEL,NANA,NUMNP,NETA,NA1,NULAY,NSLAYR,NCNS          OVRL10  7
      COMMON /CB2/ NBEAMX,NIX,NULAYB                                     OVRL10  8
      COMMON /CB4/ IN,IO                                                 OVRL10  9
      COMMON /CB300/ NPERBM,NREADB,KSIG,KIN,KC,KMAT,KPS,NOBM,NNN         OVRL1010
      COMMON /CB310/ NELX,NSMAT,NELY                                     OVRL1011
      COMMON /CB311/ PRINTB,PRINTS,DGX,DGY                               OVRL1012
      COMMON /ICORES/ ICR(9),ICORE                                       OVRL1013
      COMMON /BDIM/ RON(48)                                              OVRL1014
      COMMON /PBEAM/ NPBEAM(20)                                          OVRL1015
      COMMON /OVER10/ N1,N2,N3,N4,N5,N6,N7,N8,N9,N10,N11,N12,N13,N14     OVRL1016
      COMMON A(1)                                                        OVRL1017
C                                                                        OVRL1018
      IF (ICORE.NE.0) GO TO 10                                           OVRL1019
      ICORE=LOCF(A(1))+1                                                 OVRL1020
      GO TO 30                                                           OVRL1021
   10 CONTINUE                                                           OVRL1022
C                                                                        OVRL1023
C     CHECK FOR BEAM PLOT                                                OVRL1024
C                                                                        OVRL1025
      IF (PRINTB.NE.3HYES) GO TO 20                                      OVRL1026
      IF (NBEAMX.NE.0) CALL PLOTB (NULAYB,NBEAMX,NPERBM,A(N1),A(N2),A(N3OVRL1027
     1),A(N4),A(N5),A(N6),A(N7),A(N8))                                   OVRL1028
   20 CONTINUE                                                           OVRL1029
C                                                                        OVRL1030
C     CHECK FOR SLAB PLOT                                                OVRL1031
C                                                                        OVRL1032
      IF (PRINTS.NE.3HYES) GO TO 30                                      OVRL1033
      CALL PLOTS (NUMEL,NCNS,NELX,NELY,A(N9),A(N10),A(N11),A(N12),A(N13)OVRL1034
     1)                                                                  OVRL1035
   30 CONTINUE                                                           OVRL1036
      END                                                                OVRL1037
      SUBROUTINE PLOTB (G,H,F,ESX,SIBXXA,ITYPE,DUM,EXTRA,EXTRA1,EXTRA2,EPLOTB  2
     1XTRA3)                                                             PLOTB  3
C                                                                        PLOTB  4
C     THIS SUBROUTINE CALLS THE BEAM PLOT SUBROUTINE                     PLOTB  5
C                                                                        PLOTB  6
      INTEGER G,H,F                                                      PLOTB  7
      COMMON /CB2/ NBEAMX,NIX,NULAYB                                     PLOTB  8
      COMMON /CB4/ IN,IO                                                 PLOTB  9
      COMMON /CB300/ NPERBM,NREADB,KSIG,KIN,KC,KMAT,KPS,NOBM,NNN         PLOTB 10
      COMMON /BDIM/ RON(6),ROM(6),EDOWN(6),STRAN(6),SIGO(6),FT(6),RONT(3PLOTB 11
     1),ROMT(3),EDOWNT(3),EDOWNR(3)                                      PLOTB 12
      DIMENSION ESX(G,H), SIBXXA(G), ITYPE(G), DUM(G), EXTRA(F), EXTRA1(PLOTB 13
     1G,F), EXTRA2(G,F), EXTRA3(G,F)                                     PLOTB 14
C                                                                        PLOTB 15
      REWIND 33                                                          PLOTB 16
      READ (33) ESX                                                      PLOTB 17
      CALL PLTT (NULAYB,NPERBM,ESX,IO,SIBXXA,SIGO,FT,ITYPE,NOBM,DUM,EXTRPLOTB 18
     1A,EXTRA1,EXTRA2,EXTRA3,NBEAMX,KMAT)                                PLOTB 19
C                                                                        PLOTB 20
      RETURN                                                             PLOTB 21
      END                                                                PLOTB 22
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      SUBROUTINE PLTT (NLAY,NBMS,ESX,IO,SIBXXA,SIGO,FT,ITYPE,NOBM,DUM,XLPLTT    2
     1EN,ITYP,ESXO,SIG,NBEAMX,KMAT)                                      PLTT    3
C                                                                         PLTT    4
C     THIS SUBROUTINE DOES THE BEAM PRINTER PLOTS                         PLTT    5
C                                                                         PLTT    6
      DIMENSION IDIST(25), PLAT(150), ESX(NLAY,NBEAMX), SIGO(KMAT), FT(KPLTT    7
     1MAT), SIBXXA(NLAY), ITYPE(NLAY), DUM(NLAY), CHARP(10), CHARN(10), PLTT    8
     2XLEN(NBMS), ESXO(NLAY,NBMS), SIG(NLAY,NBMS), ITYP(NLAY,NBMS), DUMMPLTT    9
     3Y(1)                                                               PLTT   10
      DATA (CHARN(I),I=1,10)/1H1,1H2,1H3,1H4,1H5,1H6,1H7,1H8,1H9,1H0/     PLTT   11
      DATA (CHARP(I),I=1,10)/1HA,1HB,1HC,1HD,1HE,1HF,1HG,1HH,1HI,1HJ/     PLTT   12
      DATA BLANK,X,STAR,SLASH/1H ,1HX,1H*,1H//                            PLTT   13
      WRITE (IO,10)                                                       PLTT   14
   10 FORMAT (///,1H ,*PLOT SHOWING  CRACK-CRUSH AREAS, STRESSES, NODE APLTT   15
     1ND LAYER MARKERS FOR REFERENCE*)                                    PLTT   16
      WRITE (IO,20)                                                       PLTT   17
   20 FORMAT (1H ,*(SEE USERS MANUAL FOR DETAILS)*)                       PLTT   18
C                                                                         PLTT   19
      REWIND 3                                                            PLTT   20
      REWIND 27                                                           PLTT   21
C                                                                         PLTT   22
      DO 220 JOE=1,NOBM                                                   PLTT   23
      NPERBM=NBMS                                                         PLTT   24
      NSTART=(JOE-1)*NBMS                                                 PLTT   25
      DO 30 J=1,NPERBM                                                    PLTT   26
C                                                                         PLTT   27
      READ (3) SIBXXA                                                     PLTT   28
      READ (27) XLNGTH,GKEI,NPIX,NPKX,ITYPE,DUM,DUM,DUM,DUM               PLTT   29
C                                                                         PLTT   30
      N=NSTART+J                                                          PLTT   31
      XLEN(J)=XLNGTH                                                      PLTT   32
C                                                                         PLTT   33
C     INITIALIZE FOR PLOTTING                                             PLTT   34
C                                                                         PLTT   35
      DO 30 I=1,NLAY                                                      PLTT   36
      SIG(I,J)=SIBXXA(I)                                                  PLTT   37
      ITYP(I,J)=ITYPE(I)                                                  PLTT   38
   30 ESXO(I,J)=ESX(I,N)                                                  PLTT   39
      WRITE (IO,40) JOE                                                   PLTT   40
   40 FORMAT (///,1H ,*BEAM NUMBER *,I2,/)                                PLTT   41
C                                                                         PLTT   42
C     GET BEAM LENGTH                                                     PLTT   43
C                                                                         PLTT   44
      DIST=0.                                                             PLTT   45
      DO 50 I=1,NBMS                                                      PLTT   46
   50 DIST=DIST+XLEN(I)                                                   PLTT   47
C                                                                         PLTT   48
      IDIST(1)=1                                                          PLTT   49
      SCALE=100./DIST                                                     PLTT   50
      DO 60 I=1,NBMS                                                      PLTT   51
      II=I+1                                                              PLTT   52
   60 IDIST(II)=XLEN(I)*SCALE+.4+IDIST(I)                                 PLTT   53
      LAST=IDIST(NBMS+1)+4                                                PLTT   54
C                                                                         PLTT   55
C     INITIALIZE TO BLANK                                                 PLTT   56
C                                                                         PLTT   57
      DO 70 I=1,LAST                                                      PLTT   58
   70 PLAT(I)=BLANK                                                       PLTT   59
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C                                                                       PLTT  60
C     GET ELEMENT STAR PRINTOUT                                         PLTT  61
C                                                                       PLTT  62
      PLAT(3)=STAR                                                      PLTT  63
      DO 80 I=1,NBMS                                                    PLTT  64
      K1=IDIST(I+1)+2                                                   PLTT  65
      PLAT(K1-1)=STAR                                                   PLTT  66
   80 PLAT(K1)=STAR                                                     PLTT  67
      PLAT(LAST-3)=BLANK                                                PLTT  68
      WRITE (IO,190) (PLAT(K),K=1,LAST)                                 PLTT  69
      WRITE (IO,90)                                                     PLTT  70
   90 FORMAT (/)                                                        PLTT  71
C                                                                       PLTT  72
C     DO BEAM PLOT                                                      PLTT  73
C                                                                       PLTT  74
      DO 180 I=1,NLAY                                                   PLTT  75
      DO 170 J=1,NBMS                                                   PLTT  76
      K1=IDIST(J)+2                                                     PLTT  77
      K2=IDIST(J+1)+2                                                   PLTT  78
      PLAT(1)=STAR                                                      PLTT  79
      PLAT(2)=BLANK                                                     PLTT  80
      IF (ESXO(I,J).NE.0.) GO TO 130                                    PLTT  81
      IF (SIG(I,J).LT.0.) GO TO 110                                     PLTT  82
C                                                                       PLTT  83
      DO 100 K=K1,K2                                                    PLTT  84
  100 PLAT(K)=BLANK                                                     PLTT  85
C                                                                       PLTT  86
      GO TO 170                                                         PLTT  87
C                                                                       PLTT  88
  110 DO 120 K=K1,K2                                                    PLTT  89
  120 PLAT(K)=SLASH                                                     PLTT  90
      GO TO 170                                                         PLTT  91
C                                                                       PLTT  92
  130 CONTINUE                                                          PLTT  93
      IF (SIG(I,J).LE.0) GO TO 150                                      PLTT  94
      K=ITYP(I,J)                                                       PLTT  95
      IRATIO=10.*ABS(SIG(I,J))/ABS(FT(K))+1                             PLTT  96
      IF (IRATIO.GT.10) IRATIO=10                                       PLTT  97
      DO 140 K=K1,K2                                                    PLTT  98
  140 PLAT(K)=CHARP(IRATIO)                                             PLTT  99
      GO TO 170                                                         PLTT 100
  150 K=ITYP(I,J)                                                       PLTT 101
      IRATIO=10.*ABS(SIG(I,J))/ABS(SIGO(K))+1                           PLTT 102
      IF (IRATIO.GT.10) IRATIO=10                                       PLTT 103
      DO 160 K=K1,K2                                                    PLTT 104
  160 PLAT(K)=CHARN(IRATIO)                                             PLTT 105
C                                                                       PLTT 106
  170 CONTINUE                                                          PLTT 107
C                                                                       PLTT 108
      PLAT(K2+1)=BLANK                                                  PLTT 109
      PLAT(K2+2)=STAR                                                   PLTT 110
  180 WRITE (IO,190) (PLAT(K),K=1,LAST)                                 PLTT 111
  190 FORMAT (1H ,135A1)                                                PLTT 112
C                                                                       PLTT 113
C     GET ELEMENT STAR PRINTOUT                                         PLTT 114
C                                                                       PLTT 115
      WRITE (IO,90)                                                     PLTT 116
      DO 200 I=1,LAST                                                   PLTT 117
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  200 PLAT(I)=BLANK                                                    PLTT 118
      PLAT(3)=STAR                                                     PLTT 119
      DO 210 I=1,NBMS                                                  PLTT 120
      K1=IDIST(I+1)+2                                                  PLTT 121
      PLAT(K1-1)=STAR                                                  PLTT 122
  210 PLAT(K1)=STAR                                                    PLTT 123
      PLAT(LAST-3)=BLANK                                               PLTT 124
      WRITE (IO,190) (PLAT(K),K=1,LAST)                                PLTT 125
  220 CONTINUE                                                         PLTT 126
      RETURN                                                           PLTT 127
      END                                                              PLTT 128
      SUBROUTINE PLOTS (C,D,F,P,AS1,AFT,AST,X,Y)                       PLOTS  2
C                                                                      PLOTS  3
C     THIS SUBROUTINE CALLS FOR THE SLAB PLOT                          PLOTS  4
C                                                                      PLOTS  5
      INTEGER C,D,F,P                                                  PLOTS  6
      COMMON /CB01/ NUMEL,NANA,NUMNP,NETA,NA1,NULAY,NSLAYR,NCNS        PLOTS  7
      COMMON /CB4/ IN,IO                                               PLOTS  8
      COMMON /CB310/ NELX,NSMAT,NELY                                   PLOTS  9
      COMMON /CB311/ PRINTB,PRINTS,DGX,DGY                             PLOTS 10
      DIMENSION AS1(C,D), AFT(D), AST(D), X(F), Y(P)                   PLOTS 11
      CALL PLTS (NELX,NELY,NULAY,NCNS,NSLAYR,NUMEL,AS1,AFT,AST,X,Y,DGX,DPLOTS 12
     1GY,IO)                                                           PLOTS 13
      RETURN                                                           PLOTS 14
      END                                                              PLOTS 15
      SUBROUTINE PLTS (NELX,NELY,NULAY,NCNS,NSLAYR,NUMEL,AS1,AFT,AST,X,YPLTS  2
     1,DGX,DGY,IO)                                                     PLTS  3
C                                                                      PLTS  4
C     THIS SUBROUTINE DOES THE SLAB PLOT                               PLTS  5
C                                                                      PLTS  6
      INTEGER VARF                                                     PLTS  7
      DIMENSION X(NELX), Y(NELY), AS1(NUMEL,NCNS), AFT(NCNS), AST(NCNS),PLTS  8
     1 NUMB(20), IFM(136), MM(4), VARF(5)                              PLTS  9
      COMMON /PBEAM/ NPBEAM(20)                                        PLTS 10
      DATA (NUMB(I),I=1,20)/1H1,1H2,1H3,1H4,1H5,1H6,1H7,1H8,1H9,1H0,1H*,PLTS 11
     11H ,1HH,1HC,1H=,1HY,1HT,1HC,5H(1H ,,5H(A1))/                     PLTS 12
C                                                                      PLTS 13
C     READ TAPES                                                       PLTS 14
C                                                                      PLTS 15
      REWIND 28                                                        PLTS 16
      REWIND 31                                                        PLTS 17
      READ (31) AS1                                                    PLTS 18
      DO 10 I=1,NUMEL                                                  PLTS 19
      READ (28) XL,XL,XL,XL,XL,XL,XL                                   PLTS 20
   10 CONTINUE                                                         PLTS 21
      READ (28) X,Y                                                    PLTS 22
C                                                                      PLTS 23
C                                                                      PLTS 24
C     SCALE FACTOR                                                     PLTS 25
C                                                                      PLTS 26
      XL=0.0                                                           PLTS 27
      DO 20 I=1,NELX                                                   PLTS 28
      XL=XL+X(I)                                                       PLTS 29
   20 CONTINUE                                                         PLTS 30
      YL=0.0                                                           PLTS 31
      DO 30 I=1,NELY                                                   PLTS 32
      YL=YL+Y(I)                                                       PLTS 33
   30 CONTINUE                                                         PLTS 34
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      SX=10.0*DGX/XL                                                    PLTS  35
      SY=6.0*DGY/YL                                                     PLTS  36
C                                                                       PLTS  37
      WRITE (IO,40)                                                     PLTS  38
   40 FORMAT (//,1H0,5X,*SLAB PLOT*,//,11X,*NODE J*,63X,*NODE L*,//,18X,PLTS  39
     1*ELEMENT NUMBER*,19X,*Y = NUMBER OF YIELDED LAYERS*,//,18X,*C = NUPLTS  40
     2MBER OF CRUSHED LAYERS     T = NUMBER OF CRACKED LAYERS*,//,11X,*NPLTS  41
     3ODE I*,63X,*NODE K*,//)                                           PLTS  42
C                                                                       PLTS  43
      ILAST=NELX                                                        PLTS  44
      IFIRST=1                                                          PLTS  45
   50 CONTINUE                                                          PLTS  46
      WRITE (IO,60)                                                     PLTS  47
   60 FORMAT (///1X)                                                    PLTS  48
C                                                                       PLTS  49
C     PLOT ANOTHER PORTION OF THE BRIDGE SLAB                           PLTS  50
C                                                                       PLTS  51
C                                                                       PLTS  52
C     FIND REQUIRED SPACES FOR PLOTTING                                 PLTS  53
C                                                                       PLTS  54
      NX=1                                                              PLTS  55
      DO 70 I=IFIRST,NELX                                               PLTS  56
      N1=X(I)*SX                                                        PLTS  57
      IF (N1.LT.13) N1=13                                               PLTS  58
      IF (N1.GT.130) N1=130                                             PLTS  59
      IF ((N1+NX-1).GT.130) GO TO 80                                    PLTS  60
      ILAST=I                                                           PLTS  61
      NX=N1+NX-1                                                        PLTS  62
   70 CONTINUE                                                          PLTS  63
   80 CONTINUE                                                          PLTS  64
C                                                                       PLTS  65
C     SET TAPE 4                                                        PLTS  66
C                                                                       PLTS  67
      REWIND 4                                                          PLTS  68
      DO 110 J=1,NELY                                                   PLTS  69
      REWIND 32                                                         PLTS  70
      JEL=NELX*(NELY-J)                                                 PLTS  71
C                                                                       PLTS  72
      IF (JEL.EQ.0) GO TO 100                                           PLTS  73
      DO 90 I=1,JEL                                                     PLTS  74
      READ (32) AFT,AST                                                 PLTS  75
   90 CONTINUE                                                          PLTS  76
  100 CONTINUE                                                          PLTS  77
C                                                                       PLTS  78
      DO 110 I=1,NELX                                                   PLTS  79
      READ (32) AFT,AST                                                 PLTS  80
      IF (I.LT.IFIRST.OR.I.GT.ILAST) GO TO 110                          PLTS  81
      WRITE (4) AFT,AST                                                 PLTS  82
  110 CONTINUE                                                          PLTS  83
      REWIND 4                                                          PLTS  84
C                                                                       PLTS  85
C     SET HOLLERITH CODE FOR PLOTTING POSITIONS                         PLTS  86
C                                                                       PLTS  87
      CALL PLTC (3,NX,MM)                                               PLTS  88
      NN=0                                                              PLTS  89
      NN=NN+1                                                           PLTS  90
      VARF(NN)=NUMB(19)                                                 PLTS  91
      NN=NN+1                                                           PLTS  92
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      VARF(NN)=NUMB(MM(1))                                              PLTS  93
      NN=NN+1                                                           PLTS  94
      VARF(NN)=NUMB(MM(2))                                              PLTS  95
      NN=NN+1                                                           PLTS  96
      VARF(NN)=NUMB(MM(3))                                              PLTS  97
      NN=NN+1                                                           PLTS  98
      VARF(NN)=NUMB(20)                                                 PLTS  99
C                                                                       PLTS 100
C     FIRST STAR LINE FOR THIS ROW                                      PLTS 101
C                                                                       PLTS 102
C     DO WE HAVE A BEAM AT THIS NODE POINT                              PLTS 103
C                                                                       PLTS 104
      J=0                                                               PLTS 105
      IB=3HNO                                                           PLTS 106
      NPI=1+(NELY-J)*(NELX+1)                                           PLTS 107
      DO 120 II=1,20                                                    PLTS 108
      IF (NPBEAM(II).EQ.0) GO TO 130                                    PLTS 109
      IF (NPI.EQ.NPBEAM(II)) IB=3HYES                                   PLTS 110
  120 CONTINUE                                                          PLTS 111
  130 CONTINUE                                                          PLTS 112
C                                                                       PLTS 113
      NN=0                                                              PLTS 114
      DO 140 II=1,NX                                                    PLTS 115
      NN=NN+1                                                           PLTS 116
      IFM(NN)=NUMB(11)                                                  PLTS 117
      IF (IB.EQ.3HYES) IFM(NN)=1HB                                      PLTS 118
  140 CONTINUE                                                          PLTS 119
C                                                                       PLTS 120
C     NUMBER NODE POINTS                                                PLTS 121
C                                                                       PLTS 122
      J=0                                                               PLTS 123
      II=ILAST+1                                                        PLTS 124
      NN=0                                                              PLTS 125
      DO 160 I=IFIRST,II                                                PLTS 126
      NPI=I+(NELY-J)*(NELX+1)                                           PLTS 127
      M=1                                                               PLTS 128
      IF (NPI.GT.9) M=2                                                 PLTS 129
      IF (NPI.GT.99) M=3                                                PLTS 130
      IF (NPI.GT.999) M=4                                               PLTS 131
      CALL PLTC (M,NPI,MM)                                              PLTS 132
      IF ((NN+M).GT.NX) NN=NX-M                                         PLTS 133
      DO 150 JJ=1,M                                                     PLTS 134
      NN=NN+1                                                           PLTS 135
      IFM(NN)=NUMB(MM(JJ))                                              PLTS 136
  150 CONTINUE                                                          PLTS 137
      IF (I.GT.ILAST) GO TO 160                                         PLTS 138
      NP3=X(I)*SX                                                       PLTS 139
      IF (NP3.GT.130) NP3=130                                           PLTS 140
      IF (NP3.LT.13) NP3=13                                             PLTS 141
      NN=NN+NP3-M-1                                                     PLTS 142
  160 CONTINUE                                                          PLTS 143
C                                                                       PLTS 144
      WRITE (IO,VARF) (IFM(II),II=1,NX)                                 PLTS 145
      DO 410 J=1,NELY                                                   PLTS 146
      NY=SY*Y(NELY+1-J)                                                 PLTS 147
      IF (NY.LT.5) NY=5                                                 PLTS 148
C                                                                       PLTS 149
C     FOR THIS ROW FIND FIRST LINE ,SECOND LINE, LAST LINE              PLTS 150
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C                                                                       PLTS 151
      NY1=NY/3.0                                                        PLTS 152
      NY2=2*NY/3+1                                                      PLTS 153
      NY3=NY-1                                                          PLTS 154
      DO 350 INY=1,2                                                    PLTS 155
      NYP=NY1-1                                                         PLTS 156
      IF (INY.EQ.2) NYP=NY2-NY1-1                                       PLTS 157
C                                                                       PLTS 158
C     FIRST SET OF NYP BLANK LINES                                      PLTS 159
C                                                                       PLTS 160
      IF (NYP.GT.0) CALL PLTD (NYP,NELX,SX,IFIRST,ILAST,X,IFM,NUMB,IO,VAPLTS 161
     1RF,NX)                                                            PLTS 162
      NN=0                                                              PLTS 163
      NN=NN+1                                                           PLTS 164
      IFM(NN)=NUMB(11)                                                  PLTS 165
      DO 340 I=IFIRST,ILAST                                             PLTS 166
C                                                                       PLTS 167
C     FIND X POSITIONS WITHIN EACH ELEMENT                              PLTS 168
C                                                                       PLTS 169
      NP1=X(I)/3.0*SX-1.0                                               PLTS 170
      NP2=2.0*X(I)*SX/3.0                                               PLTS 171
      NP3=SX*X(I)                                                       PLTS 172
      IF (NP3.GE.13) GO TO 170                                          PLTS 173
      NP1=3                                                             PLTS 174
      NP2=8                                                             PLTS 175
      NP3=13                                                            PLTS 176
  170 CONTINUE                                                          PLTS 177
      IF (NP3.LE.133) GO TO 180                                         PLTS 178
      NP1=42                                                            PLTS 179
      NP2=86                                                            PLTS 180
      NP3=130                                                           PLTS 181
  180 CONTINUE                                                          PLTS 182
C                                                                       PLTS 183
C     FIND NUMBER OF BLANKS                                             PLTS 184
C                                                                       PLTS 185
      NB1=NP1-3                                                         PLTS 186
      NB2=NP2-NP1-4                                                     PLTS 187
      NB3=NP3-NP2-3                                                     PLTS 188
      IF (NB1.LE.0) GO TO 200                                           PLTS 189
      DO 190 II=1,NB1                                                   PLTS 190
      NN=NN+1                                                           PLTS 191
      IFM(NN)=NUMB(12)                                                  PLTS 192
  190 CONTINUE                                                          PLTS 193
C                                                                       PLTS 194
C     GET ELEMENT NUMBER                                                PLTS 195
C                                                                       PLTS 196
  200 CONTINUE                                                          PLTS 197
      M=NELX*(NELY-J)+I                                                 PLTS 198
      IF (INY.NE.1) GO TO 210                                           PLTS 199
      CALL PLTC (4,M,MM)                                                PLTS 200
      NF=4                                                              PLTS 201
      GO TO 230                                                         PLTS 202
C                                                                       PLTS 203
C     GET CRACKED/CRUSHED LAYERS                                        PLTS 204
C                                                                       PLTS 205
  210 CONTINUE                                                          PLTS 206
      IC=0                                                              PLTS 207
      IT=0                                                              PLTS 208
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      READ (4) AFT,AST                                                  PLTS 209
      DO 220 II=1,NULAY                                                 PLTS 210
      IF (AFT(II).EQ.5HCRUSH.OR.AST(II).EQ.5HCRUSH) IC=IC+1             PLTS 211
      IF (AFT(II).EQ.5HCRACK.OR.AST(II).EQ.5HCRACK) IT=IT+1             PLTS 212
  220 CONTINUE                                                          PLTS 213
C                                                                       PLTS 214
C     SET CRUSH SYMBOL                                                  PLTS 215
C                                                                       PLTS 216
      CALL PLTC (2,IC,MM)                                               PLTS 217
      NN=NN+1                                                           PLTS 218
      IFM(NN)=NUMB(14)                                                  PLTS 219
      IF (IC.EQ.0) IFM(NN)=NUMB(12)                                     PLTS 220
      NN=NN+1                                                           PLTS 221
      IFM(NN)=NUMB(15)                                                  PLTS 222
      IF (IC.EQ.0) IFM(NN)=NUMB(12)                                     PLTS 223
C                                                                       PLTS 224
C     SET NUMBER CODES                                                  PLTS 225
C                                                                       PLTS 226
      NF=2                                                              PLTS 227
  230 CONTINUE                                                          PLTS 228
C                                                                       PLTS 229
      DO 240 II=1,NF                                                    PLTS 230
      NN=NN+1                                                           PLTS 231
      IFM(NN)=NUMB(MM(II))                                              PLTS 232
  240 CONTINUE                                                          PLTS 233
C                                                                       PLTS 234
      IF (NB2.LE.0) GO TO 260                                           PLTS 235
      DO 250 II=1,NB2                                                   PLTS 236
      NN=NN+1                                                           PLTS 237
      IFM(NN)=NUMB(12)                                                  PLTS 238
  250 CONTINUE                                                          PLTS 239
  260 CONTINUE                                                          PLTS 240
C                                                                       PLTS 241
      IF (INY.NE.1) GO TO 290                                           PLTS 242
C                                                                       PLTS 243
C     GET YIELDED LAYERS                                                PLTS 244
C                                                                       PLTS 245
      IY=0                                                              PLTS 246
      IF (NSLAYR.EQ.0) GO TO 280                                        PLTS 247
      NF=NULAY+1                                                        PLTS 248
      DO 270 II=NF,NCNS                                                 PLTS 249
      IF (AS1(M,II).NE.999.0) IY=IY+1                                   PLTS 250
  270 CONTINUE                                                          PLTS 251
  280 CONTINUE                                                          PLTS 252
C                                                                       PLTS 253
C     SET UP SYMBOLS FOR YIELDED LAYERS                                 PLTS 254
C                                                                       PLTS 255
      NN=NN+1                                                           PLTS 256
      IFM(NN)=NUMB(16)                                                  PLTS 257
      IF (IY.EQ.0) IFM(NN)=NUMB(12)                                     PLTS 258
      CALL PLTC (2,IY,MM)                                               PLTS 259
      GO TO 300                                                         PLTS 260
C                                                                       PLTS 261
C     SET UP SYMBOLS FOR CRACKED LAYERS                                 PLTS 262
C                                                                       PLTS 263
  290 CONTINUE                                                          PLTS 264
      NN=NN+1                                                           PLTS 265
      IFM(NN)=NUMB(17)                                                  PLTS 266
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      IF (IT.EQ.0) IFM(NN)=NUMB(12)                                     PLTS 267
      CALL PLTC (2,IT,MM)                                               PLTS 268
C                                                                       PLTS 269
C     SET NUMBER CODES                                                  PLTS 270
C                                                                       PLTS 271
  300 CONTINUE                                                          PLTS 272
      NN=NN+1                                                           PLTS 273
      IFM(NN)=NUMB(15)                                                  PLTS 274
      IF (IFM(NN-1).EQ.NUMB(12)) IFM(NN)=NUMB(12)                       PLTS 275
      DO 310 II=1,2                                                     PLTS 276
      NN=NN+1                                                           PLTS 277
      IFM(NN)=NUMB(MM(II))                                              PLTS 278
  310 CONTINUE                                                          PLTS 279
C                                                                       PLTS 280
      IF (NB3.LE.0) GO TO 330                                           PLTS 281
      DO 320 II=1,NB3                                                   PLTS 282
      NN=NN+1                                                           PLTS 283
      IFM(NN)=NUMB(12)                                                  PLTS 284
  320 CONTINUE                                                          PLTS 285
  330 CONTINUE                                                          PLTS 286
C                                                                       PLTS 287
      NN=NN+1                                                           PLTS 288
      IFM(NN)=NUMB(11)                                                  PLTS 289
C                                                                       PLTS 290
C     GO TO ANOTHER NELX                                                PLTS 291
C                                                                       PLTS 292
  340 CONTINUE                                                          PLTS 293
C                                                                       PLTS 294
      WRITE (IO,VARF) (IFM(II),II=1,NX)                                 PLTS 295
C                                                                       PLTS 296
C     DO IT TWICE                                                       PLTS 297
C                                                                       PLTS 298
  350 CONTINUE                                                          PLTS 299
C                                                                       PLTS 300
C     LAST SET OF NYP BLANK LINES                                       PLTS 301
C                                                                       PLTS 302
      NYP=NY3-NY2-1                                                     PLTS 303
      IF (NYP.GT.0) CALL PLTD (NYP,NELX,SX,IFIRST,ILAST,X,IFM,NUMB,IO,VAPLTS 304
     1RF,NX)                                                            PLTS 305
C                                                                       PLTS 306
C     LAST STAR LINE                                                    PLTS 307
C                                                                       PLTS 308
C     DO WE HAVE A BEAM AT THIS NODE POINT                              PLTS 309
C                                                                       PLTS 310
      IB=3HNO                                                           PLTS 311
      NPI=1+(NELY-J)*(NELX+1)                                           PLTS 312
      DO 360 II=1,20                                                    PLTS 313
      IF (NPBEAM(II).EQ.0) GO TO 370                                    PLTS 314
      IF (NPI.EQ.NPBEAM(II)) IB=3HYES                                   PLTS 315
  360 CONTINUE                                                          PLTS 316
  370 CONTINUE                                                          PLTS 317
C                                                                       PLTS 318
      NN=0                                                              PLTS 319
      DO 380 II=1,NX                                                    PLTS 320
      NN=NN+1                                                           PLTS 321
      IFM(NN)=NUMB(11)                                                  PLTS 322
      IF (IB.EQ.3HYES) IFM(NN)=1HB                                      PLTS 323
  380 CONTINUE                                                          PLTS 324
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C                                                                       PLTS 325
C     NUMBER NODE POINTS                                                PLTS 326
C                                                                       PLTS 327
      II=ILAST+1                                                        PLTS 328
      NN=0                                                              PLTS 329
      DO 400 I=IFIRST,II                                                PLTS 330
      NPI=I+(NELY-J)*(NELX+1)                                           PLTS 331
      M=1                                                               PLTS 332
      IF (NPI.GT.9) M=2                                                 PLTS 333
      IF (NPI.GT.99) M=3                                                PLTS 334
      IF (NPI.GT.999) M=4                                               PLTS 335
      CALL PLTC (M,NPI,MM)                                              PLTS 336
      IF ((NN+M).GT.NX) NN=NX-M                                         PLTS 337
      DO 390 JJ=1,M                                                     PLTS 338
      NN=NN+1                                                           PLTS 339
      IFM(NN)=NUMB(MM(JJ))                                              PLTS 340
  390 CONTINUE                                                          PLTS 341
      IF (I.GT.ILAST) GO TO 400                                         PLTS 342
      NP3=X(I)*SX                                                       PLTS 343
      IF (NP3.GT.130) NP3=130                                           PLTS 344
      IF (NP3.LT.13) NP3=13                                             PLTS 345
      NN=NN+NP3-M-1                                                     PLTS 346
  400 CONTINUE                                                          PLTS 347
C                                                                       PLTS 348
      WRITE (IO,VARF) (IFM(II),II=1,NX)                                 PLTS 349
C                                                                       PLTS 350
C     GO TO ANOTHER NELY LINE                                           PLTS 351
C                                                                       PLTS 352
  410 CONTINUE                                                          PLTS 353
      IFIRST=ILAST+1                                                    PLTS 354
      ILAST=NELX                                                        PLTS 355
      IF (IFIRST.LE.NELX) GO TO 50                                      PLTS 356
      RETURN                                                            PLTS 357
      END                                                               PLTS 358
      SUBROUTINE PLTC (NF,M,MM)                                         PLTC   2
C                                                                       PLTC   3
C     FIND HOLLERITH CODE FOR NUMBER ≠M≠                                PLTC   4
C                                                                       PLTC   5
      DIMENSION MM(4)                                                   PLTC   6
      MS=10**(NF-1)                                                     PLTC   7
      MM(1)=M/MS                                                        PLTC   8
      MSAVE=MM(1)*MS                                                    PLTC   9
      IF (NF.EQ.1) GO TO 20                                             PLTC  10
      DO 10 I=2,NF                                                      PLTC  11
      MS=MS/10                                                          PLTC  12
      MM(I)=(M-MSAVE)/MS                                                PLTC  13
      MSAVE=MSAVE+MM(I)*MS                                              PLTC  14
   10 CONTINUE                                                          PLTC  15
   20 CONTINUE                                                          PLTC  16
C                                                                       PLTC  17
C     SET ZEROS                                                         PLTC  18
C                                                                       PLTC  19
      DO 30 I=1,NF                                                      PLTC  20
      IF (MM(I).EQ.0) MM(I)=10                                          PLTC  21
   30 CONTINUE                                                          PLTC  22
C                                                                       PLTC  23
C     SET LEADING ZEROS BLANK                                           PLTC  24
C                                                                       PLTC  25
```

```
      DO 40 I=1,NF                                                    PLTC  26
      IF (MM(I).NE.10) GO TO 50                                       PLTC  27
      MM(I)=12                                                        PLTC  28
   40 CONTINUE                                                        PLTC  29
   50 CONTINUE                                                        PLTC  30
      RETURN                                                          PLTC  31
      END                                                             PLTC  32
      SUBROUTINE PLTD (NYP,NELX,SX,IFIRST,ILAST,X,IFM,NUMB,IO,VARF,NA) PLTD   2
C                                                                     PLTD   3
C     PRINT SPACER LINES                                              PLTD   4
C                                                                     PLTD   5
      INTEGER VARF                                                    PLTD   6
      DIMENSION NUMB(20), IFM(136), X(NELX), VARF(5)                  PLTD   7
      NN=0                                                            PLTD   8
      NN=NN+1                                                         PLTD   9
      IFM(NN)=NUMB(11)                                                PLTD  10
      DO 20 II=IFIRST,ILAST                                           PLTD  11
      NX=X(II)*SX                                                     PLTD  12
      IF (NX.GT.130) NX=130                                           PLTD  13
      IF (NX.LT.13) NX=13                                             PLTD  14
      NXP=NX-2                                                        PLTD  15
      DO 10 I=1,NXP                                                   PLTD  16
      NN=NN+1                                                         PLTD  17
      IFM(NN)=NUMB(12)                                                PLTD  18
   10 CONTINUE                                                        PLTD  19
      NN=NN+1                                                         PLTD  20
      IFM(NN)=NUMB(11)                                                PLTD  21
   20 CONTINUE                                                        PLTD  22
      DO 30 II=1,NYP                                                  PLTD  23
      WRITE (IO,VARF) (IFM(I),I=1,NA)                                 PLTD  24
   30 CONTINUE                                                        PLTD  25
      RETURN                                                          PLTD  26
      END                                                             PLTD  27
```

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