Table 82 Input data, **eqellipse.inp**, for STAGS for the **unstiffened equivalent ellipsoidal shell. The meridional thickness distribution is listed in WALLTHICK.STAGS. (See Table 79).** This input is based on **NGCP = 1** and the use of the user-written subroutine, **wall.F.** This is the 360-degree elastic-plastic STAGS model shown in the appendix in Fig. a1. The 410 finite element is used. The concentrated load is in the form of uniform pressure applied uniformly over a **single finite element:** the finite element at (LI,LJ) = (Row 1,Column 2) in Shell unit no. 4. This input file, when combined with the proper eqellipse.bin file, produces deformation such as that displayed in Fig. 164.

```
=====================================================================
imperfect isogrid-stiffened equivalent ellipsoidal head X_320
  0  0  0  0  0  0  0 $B-1 IGRAV,ICHECK,ILIST,INCBC,NRUNIT,NROTS,KDEV
  12  1  0  23  0,  $B-2 NUNITS,NUNITE,NSTFS,NINTS,NPATS,
  0  0  0  0  0  0  $B-2 NCONST,NIMPFS,INERT,NINSR,NPATX,NSTIFS
  2  0  0  0  0  1  $B-3 NTAM,NTAB,NTAW,NTAP,NTAMT,NGCP
  5 91,              $F-1 NROWS(1),NCOLS(1)
  5 91,              $F-1 NROWS(1),NCOLS(1)
  5 91,              $F-1 NROWS(1),NCOLS(1)
  5 91,              $F-1 NROWS(1),NCOLS(1)
  5 91,              $F-1 NROWS(1),NCOLS(1)
  5 91,              $F-1 NROWS(1),NCOLS(1)
  5 91,              $F-1 NROWS(1),NCOLS(1)
  5 91,              $F-1 NROWS(1),NCOLS(1)
  5 91,              $F-1 NROWS(1),NCOLS(1)
  5 91,              $F-1 NROWS(1),NCOLS(1)
  5 91,              $F-1 NROWS(1),NCOLS(1)
  5 91               $F-1 NROWS(2),NCOLS(1)
  1  3  2  1         $G-1 MUNIT,MBOUND,NUNIT,NBOUND
  2  3  3  1         $G-1 MUNIT,MBOUND,NUNIT,NBOUND
  3  3  4  1         $G-1 MUNIT,MBOUND,NUNIT,NBOUND
  4  3  5  1         $G-1 MUNIT,MBOUND,NUNIT,NBOUND
  5  3  6  1         $G-1 MUNIT,MBOUND,NUNIT,NBOUND
  6  3  7  1         $G-1 MUNIT,MBOUND,NUNIT,NBOUND
  7  3  8  1         $G-1 MUNIT,MBOUND,NUNIT,NBOUND
  8  3  9  1         $G-1 MUNIT,MBOUND,NUNIT,NBOUND
  9  3 10  1         $G-1 MUNIT,MBOUND,NUNIT,NBOUND
 10  3 11  1         $G-1 MUNIT,MBOUND,NUNIT,NBOUND
 11  3 12  1         $G-1 MUNIT,MBOUND,NUNIT,NBOUND
  1  2  1  4         $G-1 unit 1 is a closed shell
  2  2  2  4         $G-1 unit 2 is a closed shell
  3  2  3  4         $G-1 unit 3 is a closed shell
  4  2  4  4         $G-1 unit 4 is a closed shell
  5  2  5  4         $G-1 unit 5 is a closed shell
  6  2  6  4         $G-1 unit 6 is a closed shell
  7  2  7  4         $G-1 unit 2 is a closed shell
```

```
  8  2  8  4        $G-1 unit 8 is a closed shell
  9  2  9  4        $G-1 unit 9 is a closed shell
 10  2 10  4        $G-1 unit10 is a closed shell
 11  2 11  4        $G-1 unit11 is a closed shell
 12  2 12  4        $G-1 unit12 is a closed shell
  -1   -1           $H-1 For pole, rigid links (-1's let the
$                        computer do the counting for you!)
  1  7  1  1  0  0  $I-1 ITAM,NESP,IPLST,ITANST,ICREEP,IPLANE
 16.E+06  0.25  0.0  0.16  0.0  16.E+06  0. $I-2 E1,U12,G,RHO,A1,E2,A2
  .0075 120000.,    $I-3 E(i), S(i)
  .0088 138000.,    $I-3 E(i), S(i)
  .0102 148000.,    $I-3 E(i), S(i)
  .0122 156000.,    $I-3 E(i), S(i)
  .0156 164000.,    $I-3 E(i), S(i)
  .0200 165000.,    $I-3 E(i), S(i)
  .0400 166000.     $I-3 E(i), S(i)
  2  7  1  1  0  0  $I-1 ITAM,NESP,IPLST,ITANST,ICREEP,IPLANE
 496894.4 .333 0. .004969 496894.4 0. $I-2 E1,U12,G,RHO,A1,E2,A2
  .0075 3726.710,    $I-3 E(i), S(i)
  .0088 4285.710,    $I-3 E(i), S(i)
  .0102 4596.270,    $I-3 E(i), S(i)
  .0122 4844.720,    $I-3 E(i), S(i)
  .0156 5093.170,    $I-3 E(i), S(i)
  .0200 5124.220,    $I-3 E(i), S(i)
  .0400 5155.280     $I-3 E(i), S(i)
C
C New section added for GCP records
C
C GCP Material in one or more of shell unit walls
PLASTIC_WB_MATERIAL   1 1 1 2 0  $ I-5a matid,ngroups,nstates.onetwo
 16.E+06 0.25 0.16 0.0 7 0.     $ I-9a E,GNU,RHO,ALPHA,NSUBS,T
 .0075 120000. .0088 138000.,   $ I-9b strain, stress material 1
 .0102 148000. .0122 156000.,   $ I-9b strain, stress material 1
 .0156 164000. .0200 165000.,   $ I-9b strain, stress material 1
 .0400 166000.                  $ I-9b strain, stress material 1
C
PLASTIC_WB_MATERIAL   2 1 1 2 0  $ I-5a matid,ngroups,nstates.onetwo
 496894.4 0.333 0.004969 0. 7 0. $ I-9a E,GNU,RHO,ALPHA,NSUBS,T
 .0075 3726.71 .0088 4285.71,   $ I-9b strain, stress material 2
 .0102 4596.27 .0122 4844.72,   $ I-9b strain, stress material 2
 .0156 5093.17 .0200 5124.22,   $ I-9b strain, stress material 2
 .0400 5155.28                  $ I-9b strain, stress material 2
C
C shell unit wall props
SHELL_FABRICATION  1 2 1 0 0 $ I-5a fabid,nlayer,ipts,ishr,isym
 2  1  $ I-21a  MATID(j), j = 1,nlayer
 1  5  $ I=21b INTSHL(j), j = 1,nlayer
 1.0E-06 0.4  $ I-21c THKSHL(j), j=1,nlayer
```

```
 0.0   0.0    $ I-21d ANGSHL(j), j=1,nlayer
C
END     $ I-5a cease (end of GCP input data, all matl,all walls)
C
C unit 1 = the spherical cap
  7  0  0  0  0  1  $M-1 ISHELL,IGLOBE,NROWS,NCOLS,NLAYS,NFABS
  0.00 2.958103 0.0  360.0  49.5 $M-2 PHI1, PHI2, THETA1, THETA2, R
  0  0  0. 0. 0  1  0 $M-5 IWALL,IWIMP,ZETA,ECZ,ILIN,IPLAS,IRAMP
  410               $N-1 KELT
  0  6  6  6  0     $P-1 IBLN(i), i=1,4, IBOND
 111  111           $P-2 ITRA, IROT (conditions at pole)
  1  0  0  0  0  0  0 $Q-1 NSYS,NICS,NAMS,NUSS,NHINGE,etc.
  1  1  0           $Q-2 ISYS,NN,IFLG
 -460.  5  3  0  0  0 $Q-3 P,LT,LD,LI,LJ,LAX
  0  0  0  0  0     $R-1 IPRD,IPRR,IPRE,IPRS,IPRP
C unit 2 = toroidal
  8  0  0  0  0  1  $M-1 ISHELL,IGLOBE,NROWS,NCOLS,NLAYS,NFABS
  2.957441 6.69448 0. 360. .08364234 47.890324 $M-2 PH1,PH2,THET1,
                                               $         THET2,Ra,Rb
  0  0  0. 0. 0  1  0 $M-5 IWALL,IWIMP,ZETA,ECZ,ILIN,IPLAS,IRAMP
  410               $N-1 KELT
  6  6  6  6  0     $P-1 IBLN(i), i=1,4, IBOND
  1  0  0  0  0  0  0 $Q-1 NSYS,NICS,NAMS,NUSS,NHINGE,etc.
  1  1  0           $Q-2 ISYS,NN,IFLG
 -460.  5  3  0  0  0 $Q-3 P,LT,LD,LI,LJ,LAX
  0  0  0  0  0     $R-1 IPRD,IPRR,IPRE,IPRS,IPRP
C unit 3 = toroidal
  8  0  0  0  0  1  $M-1 ISHELL,IGLOBE,NROWS,NCOLS,NLAYS,NFABS
  6.67782 10.67682 0. 360. .4623073 44.752884 $M-2 PH1,PH2,THET1,
                                               $         THET2,Ra,Rb
  0  0  0. 0. 0  1  0 $M-5 IWALL,IWIMP,ZETA,ECZ,ILIN,IPLAS,IRAMP
  410               $N-1 KELT
  6  6  6  6  0     $P-1 IBLN(i), i=1,4, IBOND
  1  0  0  0  0  0  0 $Q-1 NSYS,NICS,NAMS,NUSS,NHINGE,etc.
  1  1  0           $Q-2 ISYS,NN,IFLG
 -460.  5  3  0  0  0 $Q-3 P,LT,LD,LI,LJ,LAX
  0  0  0  0  0     $R-1 IPRD,IPRR,IPRE,IPRS,IPRP
C unit 4 = toroidal
  8  0  0  0  0  1  $M-1 ISHELL,IGLOBE,NROWS,NCOLS,NLAYS,NFABS
  10.65673 15.12016 0. 360. 1.338907 40.095947 $M-2 PH1,PH2,THET1,
                                               $         THET2,Ra,Rb
  0  0  0. 0. 0  1  0 $M-5 IWALL,IWIMP,ZETA,ECZ,ILIN,IPLAS,IRAMP
  410               $N-1 KELT
  6  6  6  6  0     $P-1 IBLN(i), i=1,4, IBOND
  2  0  0  0  0  0  0 $Q-1 NSYS,NICS,NAMS,NUSS,NHINGE,etc.
  1  1  0           $Q-2 ISYS,NN,IFLG
 -460.  5  3  0  0  0 $Q-3 P,LT,LD,LI,LJ,LAX
  2  1  0           $Q-2 ISYS,NN,IFLG
```

```
 -1.0  5  3  1  2  0 $Q-3 P,LT,LD,LI,LJ,LAX
  0  0  0  0  0     $R-1 IPRD,IPRR,IPRE,IPRS,IPRP
C unit 5 = toroidal
  8  0  0  0  0  1  $M-1 ISHELL,IGLOBE,NROWS,NCOLS,NLAYS,NFABS
  15.08829 20.32144 0. 360. 2.895449 34.199043 $M-2 PH1,PH2,THET1,
                                               $         THET2,Ra,Rb
  0  0  0. 0. 0  1  0 $M-5 IWALL,IWIMP,ZETA,ECZ,ILIN,IPLAS,IRAMP
  410               $N-1 KELT
  6  6  6  6  0     $P-1 IBLN(i), i=1,4, IBOND
  1  0  0  0  0  0  0 $Q-1 NSYS,NICS,NAMS,NUSS,NHINGE,etc.
  1  1  0           $Q-2 ISYS,NN,IFLG
 -460.  5  3  0  0  0 $Q-3 P,LT,LD,LI,LJ,LAX
  0  0  0  0  0     $R-1 IPRD,IPRR,IPRE,IPRS,IPRP
C unit 6 = toroidal
  8  0  0  0  0  1  $M-1 ISHELL,IGLOBE,NROWS,NCOLS,NLAYS,NFABS
  20.26536 26.78145 0. 360. 5.259145 27.465466 $M-2 PH1,PH2,THET1,
                                               $         THET2,Ra,Rb
  0  0  0. 0. 0  1  0 $M-5 IWALL,IWIMP,ZETA,ECZ,ILIN,IPLAS,IRAMP
  410               $N-1 KELT
  6  6  6  6  0     $P-1 IBLN(i), i=1,4, IBOND
  1  0  0  0  0  0  0 $Q-1 NSYS,NICS,NAMS,NUSS,NHINGE,etc.
  1  1  0           $Q-2 ISYS,NN,IFLG
 -460.  5  3  0  0  0 $Q-3 P,LT,LD,LI,LJ,LAX
  0  0  0  0  0     $R-1 IPRD,IPRR,IPRE,IPRS,IPRP
C unit 7 = toroidal
  8  0  0  0  0  1  $M-1 ISHELL,IGLOBE,NROWS,NCOLS,NLAYS,NFABS
  26.79548 32.96853 0. 360. 7.971097 21.436380 $M-2 PH1,PH2,THET1,
                                               $         THET2,Ra,Rb
  0  0  0. 0. 0  1  0 $M-5 IWALL,IWIMP,ZETA,ECZ,ILIN,IPLAS,IRAMP
  410               $N-1 KELT
  6  6  6  6  0     $P-1 IBLN(i), i=1,4, IBOND
  1  0  0  0  0  0  0 $Q-1 NSYS,NICS,NAMS,NUSS,NHINGE,etc.
  1  1  0           $Q-2 ISYS,NN,IFLG
 -460.  5  3  0  0  0 $Q-3 P,LT,LD,LI,LJ,LAX
  0  0  0  0  0     $R-1 IPRD,IPRR,IPRE,IPRS,IPRP
C unit 8 = toroidal
  8  0  0  0  0  1  $M-1 ISHELL,IGLOBE,NROWS,NCOLS,NLAYS,NFABS
  32.94721 39.85107 0. 360. 10.52211 16.758169 $M-2 PH1,PH2,THET1,
                                               $         THET2,Ra,Rb
  0  0  0. 0. 0  1  0 $M-5 IWALL,IWIMP,ZETA,ECZ,ILIN,IPLAS,IRAMP
  410               $N-1 KELT
  6  6  6  6  0     $P-1 IBLN(i), i=1,4, IBOND
  1  0  0  0  0  0  0 $Q-1 NSYS,NICS,NAMS,NUSS,NHINGE,etc.
  1  1  0           $Q-2 ISYS,NN,IFLG
 -460.  5  3  0  0  0 $Q-3 P,LT,LD,LI,LJ,LAX
  0  0  0  0  0     $R-1 IPRD,IPRR,IPRE,IPRS,IPRP
C unit 9 = toroidal
  8  0  0  0  0  1  $M-1 ISHELL,IGLOBE,NROWS,NCOLS,NLAYS,NFABS
```

```
  39.77901 48.82777 0. 360. 13.07984 12.785950 $M-2 PH1,PH2,THET1,
                                               $         THET2,Ra,Rb
  0  0  0. 0. 0  1  0 $M-5 IWALL,IWIMP,ZETA,ECZ,ILIN,IPLAS,IRAMP
  410               $N-1 KELT
  6  6  6  6  0     $P-1 IBLN(i), i=1,4, IBOND
  1  0  0  0  0  0  0 $Q-1 NSYS,NICS,NAMS,NUSS,NHINGE,etc.
  1  1  0           $Q-2 ISYS,NN,IFLG
 -460.  5  3  0  0  0 $Q-3 P,LT,LD,LI,LJ,LAX
  0  0  0  0  0     $R-1 IPRD,IPRR,IPRE,IPRS,IPRP
C unit 10 = toroidal
  8  0  0  0  0  1  $M-1 ISHELL,IGLOBE,NROWS,NCOLS,NLAYS,NFABS
  48.74254 60.90592 0. 360. 15.55374 9.5117826 $M-2 PH1,PH2,THET1,
                                               $         THET2,Ra,Rb
  0  0  0. 0. 0  1  0 $M-5 IWALL,IWIMP,ZETA,ECZ,ILIN,IPLAS,IRAMP
  410               $N-1 KELT
  6  6  6  6  0     $P-1 IBLN(i), i=1,4, IBOND
  1  0  0  0  0  0  0 $Q-1 NSYS,NICS,NAMS,NUSS,NHINGE,etc.
  1  1  0           $Q-2 ISYS,NN,IFLG
 -460.  5  3  0  0  0 $Q-3 P,LT,LD,LI,LJ,LAX
  0  0  0  0  0     $R-1 IPRD,IPRR,IPRE,IPRS,IPRP
C unit 11 = toroidal
  8  0  0  0  0  1  $M-1 ISHELL,IGLOBE,NROWS,NCOLS,NLAYS,NFABS
  60.95361 75.15099 0. 360. 17.45365 7.3341379 $M-2 PH1,PH2,THET1,
                                               $         THET2,Ra,Rb
  0  0  0. 0. 0  1  0 $M-5 IWALL,IWIMP,ZETA,ECZ,ILIN,IPLAS,IRAMP
  410               $N-1 KELT
  6  6  6  6  0     $P-1 IBLN(i), i=1,4, IBOND
  1  0  0  0  0  0  0 $Q-1 NSYS,NICS,NAMS,NUSS,NHINGE,etc.
  1  1  0           $Q-2 ISYS,NN,IFLG
 -460.  5  3  0  0  0 $Q-3 P,LT,LD,LI,LJ,LAX
  0  0  0  0  0     $R-1 IPRD,IPRR,IPRE,IPRS,IPRP
C unit 12 = toroidal
  8  0  0  0  0  1  $M-1 ISHELL,IGLOBE,NROWS,NCOLS,NLAYS,NFABS
  75.3152 89.91051 0.0 360.0 18.40842 6.3415871 $M-2 PH1,PH2,THET1,
                                               $         THET2,Ra,Rb
  0  0  0. 0. 0  1  0 $M-5 IWALL,IWIMP,ZETA,ECZ,ILIN,IPLAS,IRAMP
  410               $N-1 KELT
  6  6  0  6  0     $P-1 IBLN(i), i=1,4, IBOND
 001  000           $P-2 ITRA, IROT (conditions at pole)
  1  0  0  0  0  0  0 $Q-1 NSYS,NICS,NAMS,NUSS,NHINGE,etc.
  1  1  0           $Q-2 ISYS,NN,IFLG
 -460.  5  3  0  0  0 $Q-3 P,LT,LD,LI,LJ,LAX
  0  0  0  0  0     $R-1 IPRD,IPRR,IPRE,IPRS,IPRP
$
$      ELEMENT UNIT for RIGID LINKS
$
$ S-1 records...
$USRPT unit row col  ignore coords  freedoms  AUX  #defs  layer
```

```
  1     1    1   1   3*0.           2*111     0     90      0
  1     0    0   1   $ Increment variable above by value
END                  $ Computer does the counting for you!
$
$ Element records, "command method"
E120_ELEMENTS        $ Ask for rigid link element
$N1 N2 N3 Kelt Ndefs, increment N1,N2,N3. N3 must be unity.
 1  2  1  120   89    1  1  0  $  See T1 record. Want 89 elements
 1. $ SCALE
END  $ Computer did the counting, incrementation
0   $ No loads
0   $ No printed output
=================================================================
```