BOSOR5

16

BOSOR5 CASE WITH IMPOSED END SHORTENING

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$ BOSOR5LOG
Previous logical name assignment replaced

 BOSOR5 COMMANDS HAVE BEEN ACTIVATED.
The BOSOR5 commands, in the general order in which
you would probably use them, are:

  HELP5       (get information on BOSOR5.)
  INPUT       (you provide segment-by-seg. input)
  ASSEMBLE    (concatenates segment data files)
  BOSORREAD   (batch run of BOSOR5 preprocessor)
  MAINSETUP   (you provide input for mainprocessor)
  BOSORMAIN   (batch run of BOSOR5 mainprocessor)
  POSTSETUP   (you provide input for postprocessor)
  BOSORPOST   (batch run of BOSOR5 postprocessor)
  BOSORPLOT   (batch run for generating plot files)
  CLEANUP     (delete all except for .DOC file)
  GETSEGS     (generate segment files from .DOC)
  MODIFY      (modify a segment file)
  CHECKFILE   (check  a segment file)

Please consult the following sources for more
information about BOSOR5:
  1.  HELP5 file    (type HELP5)
  2.  BOSOR5ST.ORY  (good idea to print this file)
  3.  Documents listed under HELP5 OVERVIEW DOC



$ INPUT

PROMPT FILES HAVE NOW BEEN ASSIGNED.

ENTER BOSOR5 CASE NAME: DISP
  No files found.


Do you want to provide data for a new structural
segment, or add data to that for an existing
structural segment (Y or N) ? : Y
Previous logical name assignment replaced

AGAIN, ENTER THE BOSOR5 CASE NAME
DISP
Which segment is this?=1
                                                    1
Are you correcting, adding to, or checking an existing file?=N
                                                      N
BOSOR5 INPUT DATA, INTERACTIVE MODE

Initial prompts are short, and contain data names a new user
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will not be familiar with.  Please type HELP or H instead of
any datum called for, and you will get more information on that
datum.

Page numbers contained in some of the prompts refer to the
original BOSOR5 user's manual, "BOSOR5--a computer program
for buckling of elastic-plastic complex shells of revolution
including large deflections and creep", Lockheed Missiles &
Space Co. Report LMSC-D407166, December 1974, Vol. 1: User's
manual, input data.  This user's manual contains additional
discussion and figures.



Please provide a title (42 characters or less)...

 IMPOSED END DISPLACEMENT
NSEG  = number of shell segments (less than 95)=1
                                                 1

The following input must be provided by you for each
shell segment.  See p. P1 for a list of the types of
input data required.

NMESH=no. of node points (5=min.;98=max.)=31
                                                31
NTYPEH= control integer (1 or 2 or 3) for nodal point spacing=3
                                                 3

Geometry of the current segment...

NSHAPE= indicator (1,2 or 4) for geometry of meridian=1
                                                 1
R1     = radius at beginning of segment (see p. P7)=30
                                                30
Z1     = axial coordinate at beginning of segment=0
                                                 0
R2     = radius at end of segment=30
                                                30
Z2     = axial coordinate at end of segment=10
                                                10

Imperfection geometry....

IMP   = indicator for imperfection (0=none, 1=some)=0
                                                 0
NTYPEZ= control (1 or 3) for reference surface location=3
                                                 3
ZVAL  = distance from leftmost surf. to reference surf.=.5
                                          0.5000000
Do you want to print out r(s), r'(s), etc. for this segment?=N
                                                  N
NRINGS= number (max=20) of discrete rings in this segment=1
```

1
NTYPE = control for identification of ring location (2=z, 3=r)=2
2
Z(I) = axial coordinate of Ith ring, z(1)=10
10
NTYPER= type (0 or 1) of discrete ring no.(1)=H

0 means fake ring, needed as a place to "hang" a line load
1 indicates the presence of a real ring. Data for the Kth
discrete ring in the current segment will be read in.
The discrete ring is considered to be composed of a
number of straight segments of uniform thickness. Control
integers are first read in to determine whether or not a
similar ring segment has been specified previously,
either in this current shell segment or in a previous
shell segment. See pp. P20-P29 for input data.

NTYPER= type (0 or 1) of discrete ring no.(1)=0
0
Do you want general information on loading?=Y
Y

The following input is related to loading of this
segment. All loads are considered to be axisymmetric
and to be products of spatial times temporal functions.
For example, the pressure, p(s,time), is given by:
p(s,time) = Po(s) * f(time)
in which s is the meridional arc length. In this section
you will be asked to provide only the spatial variation
of the loads [e.g. Po(s)] and pointers to the temporal
variations, not the temporal variations f(t) themselves.
The f(t) to which the pointers point will be asked for
after data for all the shell segments have been provided
by you. (See pp. P30-P31 for discussion and illustrations.)

There are three types of loading:
1. temperature
2. normal pressure and meridional traction, and
3. line loads and/or imposed displacement components
applied at centroids of discrete rings.

Temperature rise (+) above or fall (-) below that
corresponding to the zero stress state. You will be
asked to provide distributions along the meridian
and through the thickness. (See pp. P32-P39)

NTSTAT = number of temperature callout points along meridian=0
0

Next, provide input for normal pressure and meridional
traction...

NPSTAT = number of meridional callouts for pressure=0

Next, please provide applied line loads and/or imposed
axisymmetric displacement components for this shell segment...

LINTYP=control for line loads or disp.(0=none,1=some)=H

Line loads must always be associated with a discrete ring,
and they are assumed to act at the discrete ring centroid,
as shown in the Fig. at the bottom of p. P47. Note that
hydrostatic pressure gives rise to line loads, pr/2, at
the ends of the shell structure, thus requiring you to use
LINTYP = 1 for those segments in which pr/2 acts.

Imposed axisymmetric displacement components (USTAR, WSTAR,
CHI, see page P66, left-hand top for positive values) must
always be associated with a discrete ring. In the following
input for loading:

V(K) can mean axial load or axial displacement
(note: positive V (load) [p. P47] is in opposite
direction from positive V (displacement)
[USTAR on p. P66])
HF(K) can mean radial load or radial displacement
FM(K) can mean meridional moment or meridional rotation

LINTYP=control for line loads or disp.(0=none,1=some)=H
There is no more help. Do your best.
LINTYP=control for line loads or disp.(0=none,1=some)=1
1
Any axial loads or imposed axial disp. in this seg.?=Y
Y
V(K)=axial disp. or load/length of circ. at ring no.(1)=H

Line load is positive as shown in Fig. on p. P47.
Imposed displacement positive as shown on p. P66 (USTAR)
The actual line load or imposed axial displacement is the
product:

V = V(K)*F1(time)

in which F1(time) remains to be specified.

V(K)=axial disp. or load/length of circ. at ring no.(1)=-1
-1
ISTEP1 = pointer to time function associated with V(1)=1
1
Any radial loads or imposed radial disp. in this seg.?=N
N
Any applied meridional rotat. or moments in this seg.?=N
N

Input for orthotropic layered wall construction follows.
Note...circumferential or meridional stiffeners can be

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included by smearing their properties as shown on p. P55
and as described below.

Do you want to include smeared stiffeners?=N
                                                        N
LAYERS = number of layers (max. = 6)=1
                                                       1
Are all the layers of constant thickness?=Y
                                                        Y
MATL = type of material for shell wall layer no.(  1)=1
                                                       1
T(i) = thickness of ith layer (i=1 = leftmost), T(  1)=1
                                                       1
G(i) = shear modulus of ith layer, G(  1)=3846000.
                                                 3846000.
EX(i)= modulus in meridional direction, EX(  1)=10000000.
                                                0.1000000E+08
EY(i)= modulus in circumferential direction, EY(  1)=10000000.
                                                0.1000000E+08
UXY(i)= Poisson's ratio (EY*UXY = EX*UYX).   UXY(  1)=.3
                                                0.3000000
ALPHA1(i)=coef. thermal exp. in merid. direction, ALPHA1(  1)=0
                                                       0
ALPHA2(i)=coef. thermal exp. in circ. direction, ALPHA2(  1)=0
                                                       0
Do you wish to include plasticity in this segment?=Y
                                                        Y
Do you wish to include creep in this segment?=N
                                                        N

Shell wall layer no. 1.  A stress-strain curve
the material of this layer must be provided by you
if the same material has not appeared in a previous
layer of this segment or in the shell wall of a
previous shell segment.  Note that you must provide
a stress-strain curve here even if the same material
has been specified previously for a discrete ring
segment.

Is this a new shell wall material?=Y
                                                       Y

Stress-strain curve for material in shell wall
layer no. 1 . . .

NPOINT = number of points in s.s.curve, layer no.(  1)=3
                                                       3
NITEG=no. integration pts. thru thickness, layer no.(  1)=5
                                                       5
Do you want to use power law for stress-strain curve?=N
                                                        N
EPS(i)=strain coordinates of s-s curve, EPS(  1)=0
                                                       0
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 EPS(i)=strain coordinates of s-s curve, EPS(  2)=.003
                                          0.3000000E-02
 EPS(i)=strain coordinates of s-s curve, EPS(  3)=1
                                                    1
 SIG(i)=stress coordinates of s-s curve, SIG(  1)=0
                                                    0
 SIG(i)=stress coordinates of s-s curve, SIG(  2)=30000
                                                30000
 SIG(i)=stress coordinates of s-s curve, SIG(  3)=30000
                                                30000
 Do you want to have C(i,j) printed for this segment?=N
                                                     N

 Directory DRC1:[BUSHNELL]

 DISP.SEG;1               9/12     7-NOV-1984 10:25

 Total of 1 file, 9/12 blocks.
 Want to add more structural segments now (Y or N) ? : N
 Have you supplied data for all structural segments? : Y

 Next, give global input and input for constraint
 conditions....

 Do you want to supply these data now (Y or N) ? : Y
 Previous logical name assignment replaced

 AGAIN, ENTER THE BOSOR5 CASE NAME
 DISP
 How many segments in the structure?=1
                                                    1
 Are you correcting, adding to, or checking an existing file?=N
                                                      N

 Next, provide data which pertain to the entire structure,
 such as time variation of loads, boundary conditions, and
 junction conditions...

 Do you want information on time functions for loading?=N
                                                      N
 IUTIME = control for time increment (0 or 1). IUTIME=1
                                                    1
 DTIME = time increment=1
                                                    1
 TMAX = maximum time to be encountered during this case=10000000.
                                           0.1000000E+08

 Next, specify the various time functions associated with
 the loads on the structure. These are the fi(time) to which
 the pointers, ISTEP, IDTEMP, etc. point.

 NFTIME= number of different functions of time=1
                                                    1
```

```
Next, please provide the time variations of loading which
correspond to the pointers IDTEMP, ISTEP, etc. that you
have already given. Each time-varying load factor is to be
provided by you in the form of a vector of time callouts,
T(i,j), j=1,NPOINT, followed by a vector of corresponding
load factors F(i,j), j=1,NPOINT, where i = 1, 2, 3...NFTIME.
The index j is in the inner loop.

NPOINT=no. of points j for ith load factor F(i,j). i=(  1)=2
                                                       2

Next, provide the vector of times T(i,j). i=

T(i,j)=jth time callout for ith time function, j =(  1)=0
                                                       0
T(i,j)=jth time callout for ith time function, j =(  2)=10000000.
                                                 0.1000000E+08

Next, provide the vector of load factors F(i,j). i=

F(i,j)=jth value for ith load factor. j =(  1)=0
                                                       0
F(i,j)=jth value for ith load factor. j =(  2)=10000000.
                                                 0.1000000E+08
How many segments are there in the structure?=1
                                                       1

Four kinds of constraint conditions exist in BOSOR5:

 1. constraints to ground (e.g. boundary conditions)
 2. juncture compatibility conditions
 3. regularity conditions at poles (where radius r = 0)
 4. constraints to prevent rigid body displacements

See the figs. on p. P67, for example. There is a constraint
to ground (boundary condition) at Seg. 8, Point 8; there are
several juncture conditions (e.g. Seg. 2, Pt. 1 is connected
to Seg. 1, Pt. 9); there are several poles (e.g. Seg. 1,
Pt. 1).  Note that if a shell is not anywhere attached to
ground, such as is the case for the example shown on p. P75,
you must choose a node at which to prevent rigid body
motion.  You must choose this node in the section below where
you are asked about constraints to ground. In a section
following the "constraints-to-ground" section, you will
be asked to provide specific data for preventing rigid body
motion.  Types of rigid body motion are shown on p. P73. An
example of appropriate input data is listed on p. P75, bottom.

 CONSTRAINT CONDITIONS FOR SEGMENT NO. ISEG =           1
Number of poles (places where r=0) in SEGMENT=0
                                                       0
At how many stations is this segment constrained to ground?=H
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This count does not include poles. Multiple constraints to
ground within any one segment must be spaced at intervals of
at least 3 nodal points.

At how many stations is this segment constrained to ground?=2
                                                          2
INODE = nodal point number of constraint to ground, INODE(  1)=1
                                                          1
IUSTAR=axial displacement constraint (0 or 1 or 2)=H

The nature of the constraint condition is governed by four
integers which, in the case of a connection to ground,
indicate whether USTAR, VSTAR, WSTAR, and CHI are free
or constrained to be zero or forced to have certain finite
values. For example, IUSTAR may be 0 or 1 or 2 :
   IUSTAR = 0 means that USTAR is free at the node INODE
   IUSTAR = 1 means that USTAR   =  0  at the node INODE
   IUSTAR = 2 means that USTAR is imposed at  node INODE
For example, simple support at the node INODE on a cylindrical
shell is indicated by:
   IUSTAR = 0 (axial displacement USTAR is free)
   IVSTAR = 1 (circumferential displacement VSTAR is zero)
   IWSTAR = 1 (radial displacement WSTAR is zero)
   ICHI   = 0 (meridional rotation CHI is free)
An example of imposed axial displacement is:
   IUSTAR = 2 (axial displacement USTAR is imposed)
   IVSTAR = 0 (circumferential displacement VSTAR is free)
   IWSTAR = 0 (radial displacement WSTAR is free)
   ICHI   = 1 (meridional rotation CHI is zero)
Note that the constraints are applied in an (axial,radial)
sense, not in a (meridional,normal) sense. At the bottom of
p. P65 the directions of displacement components USTAR and
WSTAR are shown, as well as CHI and V.  VSTAR is the same as V.

IUSTAR=axial displacement constraint (0 or 1 or 2)=1
                                                          1
IVSTAR= circumferential displacement (0=free, 1=constrained)=1
                                                          1
IWSTAR=radial displacement(0=free,1=constrained,2=imposed)=1
                                                          1
ICHI=meridional rotation (0=free,1=constrained,2=imposed)=1
                                                          1
D1    = radial component of offset of ground support=0
                                                          0
D2    = axial component of offset of ground support=0
                                                          0
Is this constraint the same for both prebuckling and buckling?=Y
                                                           Y
INODE = nodal point number of constraint to ground, INODE(  2)=31
                                                         31
IUSTAR=axial displacement constraint (0 or 1 or 2)=2
                                                          2
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IVSTAR= circumferential displacement (0=free, 1=constrained)=0\0\1
                                                          1
IWSTAR=radial displacement(0=free,1=constrained,2=imposed)=1
                                                          1
ICHI=meridional rotation (0=free,1=constrained,2=imposed)=1
                                                          1
D1     = radial component of offset of ground support=0
                                                          0
D2     = axial component of offset of ground support=0
                                                          0
Is this constraint the same for both prebuckling and buckling?=Y\Y\N
                                                            N
IUSTARB= axial displacement for buckling or vibration phase=1
                                                          1
IVSTARB= circ. displacement for buckling or vibration phase=1
                                                          1
IWSTARB= radial displacement for buckling or vibration=1
                                                          1
ICHIB  = meridional rotation for buckling or vibration=1
                                                          1
Is this segment joined to any lower-numbered segments?=N
                                                            N

It may be necessary to provide additional constraint to
ground in order to prevent rigid body motion in the
bifurcation buckling phase of the analysis.  All possible
types of rigid body motion are shown on p. P73. Rigid body
motion corresponds to n = 0 or n = 1 circumferential waves.
There is no rigid body component for any harmonic with n
greater than or equal to 2.  Note that the following question
applies only to the bifurcation buckling phase of the
analysis, not to the axisymmetric prebuckling phase.

Given existing constraints, are rigid body modes possible?=N
                                                            N

Directory DRC1:[BUSHNELL]

DISP.SEG;2                6/8      7-NOV-1984 10:33
DISP.SEG;1                9/12     7-NOV-1984 10:25

Total of 2 files, 15/20 blocks.

If you have completed input for all structural
segments and for the constraint conditions, next
give the command  ASSEMBLE  .
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