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Date: November 30, 2001

Appendix LT-1

Analyses for Adjusted LTSP Horizontal Loads

This Appendix presents analyses for adjusted LTSP horizontal loads.

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DISCUSSION and CONCLUSIONS

During the course of the analysis and design of the pads, it was determined that the horizontal component of the LTSP was below the required value somewhat less than 5%. The vertical component was not affected. In the Holtec analysis of the casks, the conclusion is made that the increase, in the LTSP forces, does not result in the LTSP governing the design of the pad. This Appendix presents the results of the small analysis that confirms this conclusion considering the nonlinear behavior of the pads. The analysis was performed simply by reanalyzing the pad for the LTSP forces with the horizontal component factored up by 5%. Thus load steps 1 to 5 here are load steps 11 to 15 (see **Gravity and Seismic Loads**) with the 440 Kips horizontal factored to 462 Kips.

The results are shown below in Tables LT-5-1 and LT-5-2. These results show that the predicted displacements and stresses are still below the governing Hosgri cases. Compare Table LT-5-1 to Table 2 and LT-5-2 to Table 3. Also, given the relative magnitudes of the values presented here, the conclusions reached in **Pad Response at Reduced Concrete Density,** see also Table 13, remain valid. Load components are combined using the 100-40-40 rule.

Table LT-5-1 MAXIMUM PAD and CASK DISPLACEMENTS ADJUSTED LTSP WITH SOFT ROCK

LS	Direction	Maximum Pad δ_{Max}	Maximum Cask δ_{Cask}
1	N	0.056	0.000557
2	N32.93W	0.093	0.0206
3	N45W	0.095	0.0248
4	N57.07W	0.088	0.0255
5	W	0.044	0.0119

Table LT-5-2 PAD STRESS RESPONSES ADJUSTED LTSP WITH SOFT ROCK

LS	Direction	$\sigma_{X\ Max}$	$\sigma_{X\ Min}$	$\sigma_{Z\ Max}$	$\sigma_{Z\ Min}$	$\sigma_{1\ Max}$	$\sigma_{3\ Min}$
1	N	45	-98	265	-392	335	-619
2	N32.93W	142	-262	230	-396	352	-771
3	N45W	189	-311	204	-365	349	-776
4	N57.07W	230	-348	171	-317	341	-748
5	W	259	-390	58	-127	309	-574

EQUILIBRIUM

Below are the calculations that compute the expected reactions from the ANSYS analyses:

Pad Weight is 68*105*7.5*0.15 = 8032.5 Kip

Load Step 1 - Apply in the North (Z) direction:

Sum of Applied Loads

Fx = 0
Fy = 258320*20 = 5166400
Fz = 1.05*440000*20 = 9240000

Sum of Forces at Pad/Rock Interface and at Rock Boundary

Fx = 0
Fy = 258320*20 + 0.720*8032500 = 10949800
Fz = 1.05*440000*20 + 0.894*8032500 = 16421055

Load Step 2 - Apply in the North 32.93 degrees West direction:

Sum of Applied Loads

Fx = 1.05*239190*20 = 5022990
Fy = 258320*20 = 5166400
Fz = 1.05*369308*20 = 7755468

Sum of Forces at Pad/Rock Interface and at Rock Boundary

Fx = 1.05*239190*20 + 0.486*8032500 = 8926785
Fy = 258320*20 + 0.720*8032500 = 10949800
Fz = 1.05*369308*20 + 0.750*8032500 = 13779843

Load Step 3 - Apply in the North 45 degrees West direction:

Sum of Applied Loads

Fx = 1.05*311127*20 = 6533667
Fy = 258320*20 = 5166400
Fz = 1.05*311127*20 = 6533667

Sum of Forces at Pad/Rock Interface and at Rock Boundary

Fx = 1.05*311127*20 + 0.632*8032500 = 11610207
Fy = 258320*20 + 0.720*8032500 = 10949800
Fz = 1.05*311127*20 + 0.632*8032500 = 11610207

Load Step 4 - Apply in the North 57.07 degrees West direction:

Sum of Applied Loads

Fx = 1.05*369308*20= 7755468
Fy = 258320*20 = 5166400
Fz = 1.05*239190*20= 5022990

Sum of Forces at Pad/Rock Interface and at Rock Boundary

Fx = 1.05*369308*20 + 0.750*8032500 = 13779843
Fy = 258320*20 + 0.720*8032500 = 10949800
Fz = 1.05*239190*20 + 0.486*8032500 = 8926785

Load Step 5 - Apply in the West direction:

Sum of Applied Loads

Fx = 1.05*440000*20= 9240000
Fy = 258320*20 = 5166400
Fz = 0

Sum of Forces at Pad/Rock Interface and at Rock Boundary

Fx = 1.05*440000*20 + 0.894*8032500 = 16421055
Fy = 258320*20 + 0.720*8032500 = 10949800
Fz = 0

Below is the file that scans the ANSYS database for the applied forces, the forces at the pad/rock interface and the boundary forces on the rock.

```
/com,
/com, This routine processes load results data for the
/com,   evaluation of equilibrium.
/com
/com,   Soft Rock Load Step Results
/com
/output,padsoftareac,out
/com
/com ***************************************************************************
/com ***************************************************************************
/com ***************************************************************************
/com ***************************************************************************
/com ***************************************************************************
/com ***************************************************************************
/com
/com ************************ Soft Rock Reactions ****************************
/com
/file,dcslabs2a
resume
/post1
/com
/com ***************************************************************************
/com ***************************************************************************
/com *************************  LOAD CASE 1 **********************************
set,1
eall
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com ***************************************************************************
/com ***************************************************************************
/com *************************  LOAD CASE 2 **********************************
set,2
eall
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
```

```
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com ***************************************************************************
/com ***************************************************************************
/com *************************  LOAD CASE 3 ***********************************
set,3
eall
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com ***************************************************************************
/com ***************************************************************************
/com *************************  LOAD CASE 4 ***********************************
set,4
eall
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
/com
cmsel,s,boundary
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
```

```
/com
/com
/com ************************************************************************
/com ************************************************************************
/com *************************  LOAD CASE 5 ********************************
set,5
eall
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS ******.*
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com ************************************************************************
/com
/com
fini
/output
/exit
```

Below are the equilibrium results for the soft rock analyses with adjusted LTSP loads:

```
*****************************************************************************
*****************************************************************************
*****************************************************************************
*****************************************************************************
*****************************************************************************
*****************************************************************************

************************* Soft Rock Reactions ****************************


CURRENT JOBNAME REDEFINED AS dcslabs2a

RESUME ANSYS DATA FROM FILE NAME=dcslabs2a.db

*** ANSYS GLOBAL STATUS ***

TITLE = Pad, ADJ LTSP(2), 20 Casks, 462 Kips West (X), Soft Rock
ANALYSIS TYPE =  STATIC (STEADY-STATE)
NUMBER OF ELEMENT TYPES =      6
  15348 ELEMENTS CURRENTLY SELECTED.  MAX ELEMENT NUMBER =    33177
  17051 NODES CURRENTLY SELECTED.     MAX NODE NUMBER =       17051
    259 KEYPOINTS CURRENTLY SELECTED. MAX KEYPOINT NUMBER =     259
    250 LINES CURRENTLY SELECTED.     MAX LINE NUMBER =         396
    181 AREAS CURRENTLY SELECTED.     MAX AREA NUMBER =         295
     70 VOLUMES CURRENTLY SELECTED.   MAX VOL. NUMBER =          70
     11 COMPONENTS CURRENTLY DEFINED
MAXIMUM LINEAR PROPERTY NUMBER        =       5
MAXIMUM REAL CONSTANT SET NUMBER      =       6
ACTIVE COORDINATE SYSTEM              =       0  (CARTESIAN)
MAXIMUM CONSTRAINT EQUATION NUMBER    =    4620
NUMBER OF SPECIFIED CONSTRAINTS       =    2193
NUMBER OF NODAL LOADS                 =    2160

INITIAL JOBNAME = dcslabs2a
CURRENT JOBNAME = dcslabs2a
1

***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7     *****
ANSYS/Structural U
00150104          VERSION=INTEL NT      18:53:34  NOV 24, 2001 CP=      0.931

Pad, ADJ LTSP(2), 20 Casks, 462 Kips West (X), Soft Rock


         ***** ANSYS RESULTS INTERPRETATION (POST1) *****

*** NOTE ***                            CP=      0.931   TIME= 18:53:34
Reading results into the database (SET command) will update the current
 displacement and force boundary conditions in the database with the
 values from the results file for that load set.  Note that any
```

```
 subsequent solutions will use these values unless action is taken to
 either SAVE the current values or not overwrite them (/EXIT,NOSAVE).

*************************************************************************
*************************************************************************
*************************  LOAD CASE 1 **********************************


USE LOAD STEP     1  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     1  SUBSTEP=     1  CUMULATIVE ITERATION=    13
  TIME/FREQUENCY=  1.0000
TITLE= Pad, ADJ LTSP(2), 20 Casks, 462 Kips North (Z), Soft Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.2216987E-05
 FY  =   5166400.
 FZ  =  -9240000.
 MX  =  0.1434108E+10
 MY  =  0.3769920E+10
 MZ  =  0.2107891E+10

SUMMATION POINT= -102.00     -45.000      162.00

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  = -0.2098778E-04
 FY  = -0.1094980E+08
 FZ  =  0.1642106E+08
 MX  = -0.4730646E+10
 MY  = -0.6699790E+10
 MZ  = -0.4467518E+10

SUMMATION POINT= -102.00     -45.000      162.00

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY
```

```
******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  = -0.5664296E-05
 FY  = -0.1094980E+08
 FZ  =  0.1642105E+08
 MX  = -0.4730646E+10
 MY  = -0.6699790E+10
 MZ  = -0.4467518E+10

SUMMATION POINT= -102.00     -45.000      162.00


*************************************************************************
*************************************************************************
*************************  LOAD CASE 2 **********************************


USE LOAD STEP     2  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     2  SUBSTEP=     1  CUMULATIVE ITERATION=    22
  TIME/FREQUENCY=  2.0000
TITLE= Pad, ADJ LTSP(2), 20 Casks, 462 Kips N 32.93 W (Z,X), Soft Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  -5022990.
 FY  =   5166400.
 FZ  =  -7755468.
 MX  =  0.1676829E+10
 MY  =  0.6027335E+10
 MZ  =  0.2929150E+10

SUMMATION POINT= -102.00     -45.000      162.00

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =   8926785.
 FY  = -0.1094980E+08
 FZ  =  0.1377984E+08
```

```
 MX  = -0.4973367E+10
 MY  = -0.1071044E+11
 MZ  = -0.5288777E+10

SUMMATION POINT= -102.00      -45.000      162.00

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =   8926785.
 FY  = -0.1094980E+08
 FZ  =  0.1377984E+08
 MX  = -0.4973367E+10
 MY  = -0.1071044E+11
 MZ  = -0.5288777E+10

SUMMATION POINT= -102.00      -45.000      162.00


*************************************************************************
*************************************************************************
*************************  LOAD CASE 3 ***********************************


USE LOAD STEP     3  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     3  SUBSTEP=     1  CUMULATIVE ITERATION=    26
  TIME/FREQUENCY=  3.0000
TITLE= Pad, ADJ LTSP(2), 20 Casks, 462 Kips N 45 W (Z,X), Soft Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  -6533667.
 FY  =   5166400.
 FZ  =  -6533667.
 MX  =  0.1876593E+10
 MY  =  0.6389926E+10
 MZ  =  0.3176146E+10

SUMMATION POINT= -102.00      -45.000      162.00

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1
```

```
    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1161021E+08
 FY  = -0.1094980E+08
 FZ  =  0.1161021E+08
 MX  = -0.5173131E+10
 MY  = -0.1135478E+11
 MZ  = -0.5535773E+10

SUMMATION POINT= -102.00     -45.000      162.00

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1161021E+08
 FY  = -0.1094980E+08
 FZ  =  0.1161021E+08
 MX  = -0.5173131E+10
 MY  = -0.1135478E+11
 MZ  = -0.5535773E+10

SUMMATION POINT= -102.00     -45.000      162.00


*************************************************************************
*************************************************************************
*************************  LOAD CASE 4 ********************************


USE LOAD STEP     4  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     4  SUBSTEP=     1  CUMULATIVE ITERATION=    31
  TIME/FREQUENCY=  4.0000
TITLE= Pad, ADJ LTSP(2), 20 Casks, 462 Kips N 57.07 W (Z,X), Soft Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******
```

```
***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  -7755468.
 FY  =   5166400.
 FZ  =  -5022990.
 MX  =  0.2123589E+10
 MY  =  0.6469997E+10
 MZ  =  0.3375910E+10

SUMMATION POINT= -102.00      -45.000       162.00

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1377984E+08
 FY  = -0.1094980E+08
 FZ  =   8926785.
 MX  = -0.5420127E+10
 MY  = -0.1149664E+11
 MZ  = -0.5735537E+10

SUMMATION POINT= -102.00      -45.000       162.00

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.


SELECT      COMPONENT BOUNDARY
******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1377984E+08
 FY  = -0.1094980E+08
 FZ  =   8926785.
 MX  = -0.5420127E+10
 MY  = -0.1149664E+11
 MZ  = -0.5735537E+10

SUMMATION POINT= -102.00      -45.000       162.00


*************************************************************************
*************************************************************************
*************************  LOAD CASE 5  *********************************


USE LOAD STEP     5  SUBSTEP     0  FOR LOAD CASE 0
```

```
SET COMMAND GOT LOAD STEP=      5  SUBSTEP=      1  CUMULATIVE ITERATION=     39
  TIME/FREQUENCY=  5.0000
TITLE= Pad, ADJ LTSP(2), 20 Casks, 462 Kips West (X), Soft Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  -9240000.
 FY  =   5166400.
 FZ  = -0.6277070E-05
 MX  =  0.2944848E+10
 MY  =  0.5266800E+10
 MZ  =  0.3618631E+10

SUMMATION POINT= -102.00      -45.000       162.00

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1642106E+08
 FY  = -0.1094980E+08
 FZ  =  0.1820063E-04
 MX  = -0.6241386E+10
 MY  = -0.9360001E+10
 MZ  = -0.5978258E+10

SUMMATION POINT= -102.00      -45.000       162.00

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1642105E+08
 FY  = -0.1094980E+08
 FZ  = -0.2635646E-03
 MX  = -0.6241386E+10
 MY  = -0.9360001E+10
```

```
 MZ   = -0.5978258E+10

SUMMATION POINT= -102.00      -45.000       162.00

*****************************************************************************


EXIT THE ANSYS POST1 DATABASE PROCESSOR

***** ROUTINE COMPLETED *****  CP =         15.823
```

PAD DISPLACEMENTS

Below is the ANSYS input file that scans the database for the maximum pad displacements. Element type 1 is the pad.

```
/COM
/OUTPUT,padsoftadisp.out
/com
/COM     DISPLACEMENT DATA SORTED AND PRINTED BY LOAD STEP
/COM
/COM
/COM
/COM     THIS ROUTINE SORTS AND PRINTS DISPLACEMENT DATA BY LOAD STEP
/COM     FOR BOTH THE SOFT AND HARD ROCK MODELS
/COM
/COM
/FILE,DCSLABS2A
RESUME
/header,on,off,off,off,on,off
/POST1
/COM
/COM
EALL
NALL
/COM
/COM ==============================================================================
/COM ================================  SET 1  ====================================
/COM
SET,1
ESEL,TYPE,1
NELEM
/COM
/COM ==============================================================================
/COM =======================    MAXIMUM VALUES OF Uy    ============================
/COM
NSORT,U,Y,0,0,2,SEL
PRNSOL,U
NUSORT
/COM
/COM ==============================================================================
/COM ================================  SET 2  ====================================
/COM
SET,2
ESEL,TYPE,1
NELEM
/COM
/COM ==============================================================================
/COM =======================    MAXIMUM VALUES OF Uy    ============================
/COM
NSORT,U,Y,0,0,2,SEL
PRNSOL,U
NUSORT
```

```
/COM
/COM ==============================================================================
/COM ================================  SET 3  ====================================
/COM
SET,3
ESEL,TYPE,1
NELEM
/COM
/COM ==============================================================================
/COM =======================    MAXIMUM VALUES OF Uy    ===========================
/COM
NSORT,U,Y,0,0,2,SEL
PRNSOL,U
NUSORT
/COM
/COM ==============================================================================
/COM ================================  SET 4  ====================================
/COM
SET,4
ESEL,TYPE,1
NELEM
/COM
/COM ==============================================================================
/COM =======================    MAXIMUM VALUES OF Uy    ===========================
/COM
NSORT,U,Y,0,0,2,SEL
PRNSOL,U
NUSORT
/COM
/COM ==============================================================================
/COM ================================  SET 5  ====================================
/COM
SET,5
ESEL,TYPE,1
NELEM
/COM
/COM ==============================================================================
/COM =======================    MAXIMUM VALUES OF Uy    ===========================
/COM
NSORT,U,Y,0,0,2,SEL
PRNSOL,U
NUSORT
/COM
/COM ==============================================================================
/COM ==============================================================================
/COM
FINI
/OUTPUT
/EXIT
```

Below is the ANSYS output file for the maximum pad displacements for the soft rock analyses with adjusted LTSP loads:

```
    DISPLACEMENT DATA SORTED AND PRINTED BY LOAD STEP

    THIS ROUTINE SORTS AND PRINTS DISPLACEMENT DATA BY LOAD STEP
    FOR BOTH THE SOFT AND HARD ROCK MODELS


CURRENT JOBNAME REDEFINED AS DCSLABS2A

RESUME ANSYS DATA FROM FILE NAME=DCSLABS2A.db

*** ANSYS GLOBAL STATUS ***

TITLE = Pad, ADJ LTSP(2), 20 Casks, 462 Kips West (X), Soft Rock
ANALYSIS TYPE =  STATIC (STEADY-STATE)
NUMBER OF ELEMENT TYPES =      6
   1728 ELEMENTS CURRENTLY SELECTED.  MAX ELEMENT NUMBER =    33177
    731 NODES CURRENTLY SELECTED.     MAX NODE NUMBER =       17051
    259 KEYPOINTS CURRENTLY SELECTED. MAX KEYPOINT NUMBER =     259
    250 LINES CURRENTLY SELECTED.     MAX LINE NUMBER =         396
    181 AREAS CURRENTLY SELECTED.     MAX AREA NUMBER =         295
     70 VOLUMES CURRENTLY SELECTED.   MAX VOL. NUMBER =          70
    11 COMPONENTS CURRENTLY DEFINED
MAXIMUM LINEAR PROPERTY NUMBER        =       5
MAXIMUM REAL CONSTANT SET NUMBER      =       6
ACTIVE COORDINATE SYSTEM              =       0  (CARTESIAN)
MAXIMUM CONSTRAINT EQUATION NUMBER    =    4620
NUMBER OF SPECIFIED CONSTRAINTS       =    2193
NUMBER OF NODAL LOADS                 =    2160

INITIAL JOBNAME = dcslabs2a
CURRENT JOBNAME = DCSLABS2A


PRINT HEADER
DO NOT PRINT SUBTITLE(S)
DO NOT PRINT LOAD STEP ID
DO NOT PRINT NOTE LINE(S)
PRINT COLUMN HEADER LABELS
DO NOT PRINT REPORT TOTALS
1

***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7     *****
ANSYS/Structural U
00150104          VERSION=INTEL NT      18:58:25  NOV 24, 2001 CP=      0.921

Pad, ADJ LTSP(2), 20 Casks, 462 Kips West (X), Soft Rock
```

```
          ***** ANSYS RESULTS INTERPRETATION (POST1) *****

 *** NOTE ***                            CP=      0.921   TIME= 18:58:25
 Reading results into the database (SET command) will update the current
  displacement and force boundary conditions in the database with the
  values from the results file for that load set.  Note that any
  subsequent solutions will use these values unless action is taken to
  either SAVE the current values or not overwrite them (/EXIT,NOSAVE).


    15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

    17051  NODES (OF    17051  DEFINED) SELECTED BY NALL  COMMAND.

 ==============================================================================
 ================================  SET 1  ====================================


 USE LOAD STEP     1  SUBSTEP     0  FOR LOAD CASE 0

 SET COMMAND GOT LOAD STEP=     1  SUBSTEP=     1  CUMULATIVE ITERATION=    13
   TIME/FREQUENCY=  1.0000
 TITLE= Pad, ADJ LTSP(2), 20 Casks, 462 Kips North (Z), Soft Rock

 ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

     9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

 SELECT      ALL NODES HAVING ANY ELEMENT IN ELEMENT SET.

    11550 NODES (OF    17051  DEFINED) SELECTED FROM
     9056 SELECTED ELEMENTS BY NELE COMMAND.

 ==============================================================================
 =======================    MAXIMUM VALUES OF Uy    ============================


 SORT ON ITEM=U     COMPONENT=Y     ORDER= 0  KABS= 0  NMAX=       2

 SORT COMPLETED FOR       2 VALUES.

 PRINT U    NODAL SOLUTION PER NODE
1

 ***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7     *****
 ANSYS/Structural U
 00150104          VERSION=INTEL NT      18:58:28  NOV 24, 2001 CP=      3.425

 Pad, ADJ LTSP(2), 20 Casks, 462 Kips North (Z), Soft Rock
```

```
   NODE      UX          UY          UZ          USUM
  15443  0.28423E-02 0.56146E-01 0.23651E-01 0.60991E-01
   7439 -0.28423E-02 0.56146E-01 0.23651E-01 0.60991E-01

NODE SORT REMOVED

================================================================================
================================  SET 2  ====================================


USE LOAD STEP     2  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     2  SUBSTEP=     1  CUMULATIVE ITERATION=    22
  TIME/FREQUENCY=  2.0000
TITLE= Pad, ADJ LTSP(2), 20 Casks, 462 Kips N 32.93 W (Z,X), Soft Rock

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      ALL NODES HAVING ANY ELEMENT IN ELEMENT SET.

   11550 NODES (OF    17051  DEFINED) SELECTED FROM
    9056 SELECTED ELEMENTS BY NELE COMMAND.

================================================================================
=======================    MAXIMUM VALUES OF Uy    ============================


SORT ON ITEM=U     COMPONENT=Y     ORDER= 0  KABS= 0  NMAX=       2

SORT COMPLETED FOR       2 VALUES.

PRINT U    NODAL SOLUTION PER NODE
1

***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7     *****
ANSYS/Structural U
00150104          VERSION=INTEL NT      18:58:30  NOV 24, 2001 CP=      5.939

Pad, ADJ LTSP(2), 20 Casks, 462 Kips N 32.93 W (Z,X), Soft Rock


   NODE      UX          UY          UZ          USUM
  15443  0.13447E-01 0.93323E-01 0.21319E-01 0.96667E-01
  15453  0.19568E-01 0.92639E-01 0.31191E-01 0.99688E-01

NODE SORT REMOVED

================================================================================
```

```
================================  SET 3  ====================================


USE LOAD STEP     3  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     3  SUBSTEP=     1  CUMULATIVE ITERATION=    26
  TIME/FREQUENCY=  3.0000
TITLE= Pad, ADJ LTSP(2), 20 Casks, 462 Kips N 45 W (Z,X), Soft Rock

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      ALL NODES HAVING ANY ELEMENT IN ELEMENT SET.

   11550 NODES (OF    17051  DEFINED) SELECTED FROM
    9056 SELECTED ELEMENTS BY NELE COMMAND.

==============================================================================
=======================    MAXIMUM VALUES OF Uy    ============================


SORT ON ITEM=U     COMPONENT=Y     ORDER= 0  KABS= 0  NMAX=       2

SORT COMPLETED FOR       2 VALUES.

PRINT U    NODAL SOLUTION PER NODE
1

***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7     *****
ANSYS/Structural U
00150104          VERSION=INTEL NT      18:58:33  NOV 24, 2001 CP=      8.442

Pad, ADJ LTSP(2), 20 Casks, 462 Kips N 45 W (Z,X), Soft Rock

 .

   NODE      UX          UY          UZ          USUM
  15443  0.16340E-01 0.94987E-01 0.19114E-01 0.98259E-01
  15453  0.24176E-01 0.94282E-01 0.27655E-01 0.10118

NODE SORT REMOVED

==============================================================================
================================  SET 4  ====================================


USE LOAD STEP     4  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     4  SUBSTEP=     1  CUMULATIVE ITERATION=    31
  TIME/FREQUENCY=  4.0000
TITLE= Pad, ADJ LTSP(2), 20 Casks, 462 Kips N 57.07 W (Z,X), Soft Rock
```

```
ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      ALL NODES HAVING ANY ELEMENT IN ELEMENT SET.

   11550 NODES (OF    17051  DEFINED) SELECTED FROM
    9056 SELECTED ELEMENTS BY NELE COMMAND.

==============================================================================
=======================    MAXIMUM VALUES OF Uy    ============================

SORT ON ITEM=U     COMPONENT=Y     ORDER= 0  KABS= 0  NMAX=       2

SORT COMPLETED FOR       2 VALUES.

PRINT U    NODAL SOLUTION PER NODE
1

***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7     *****
ANSYS/Structural U
00150104          VERSION=INTEL NT      18:58:36  NOV 24, 2001 CP=     10.926

Pad, ADJ LTSP(2), 20 Casks, 462 Kips N 57.07 W (Z,X), Soft Rock


   NODE      UX          UY          UZ          USUM
  15443  0.18679E-01 0.88346E-01 0.16248E-01 0.91750E-01
  15453  0.27749E-01 0.87644E-01 0.23013E-01 0.94769E-01

NODE SORT REMOVED

==============================================================================
================================  SET 5  ====================================


USE LOAD STEP     5  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     5  SUBSTEP=     1  CUMULATIVE ITERATION=    39
  TIME/FREQUENCY=  5.0000
TITLE= Pad, ADJ LTSP(2), 20 Casks, 462 Kips West (X), Soft Rock

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      ALL NODES HAVING ANY ELEMENT IN ELEMENT SET.

   11550 NODES (OF    17051  DEFINED) SELECTED FROM
    9056 SELECTED ELEMENTS BY NELE COMMAND.
```

```
==============================================================================
=======================    MAXIMUM VALUES OF Uy    ============================

SORT ON ITEM=U     COMPONENT=Y     ORDER= 0  KABS= 0  NMAX=       2

SORT COMPLETED FOR       2 VALUES.

PRINT U    NODAL SOLUTION PER NODE
1

***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7     *****
ANSYS/Structural U
00150104          VERSION=INTEL NT      18:58:39  NOV 24, 2001 CP=     13.419

Pad, ADJ LTSP(2), 20 Casks, 462 Kips West (X), Soft Rock


   NODE      UX          UY          UZ          USUM
  15443  0.21959E-01 0.44101E-01 0.48678E-02 0.49505E-01
  15363  0.21961E-01 0.44020E-01-0.48697E-02 0.49434E-01

NODE SORT REMOVED

==============================================================================
==============================================================================


EXIT THE ANSYS POST1 DATABASE PROCESSOR


***** ROUTINE COMPLETED *****  CP =        13.459
```

CASK DISPLACEMENTS

Below is the ANSYS input file that scans the database for the maximum cask displacements for the soft rock analysis with adjusted LTSP loads:

```
/output, padsoftacaskd.out
/com
/file,dcslabs2a
resume
/header,on,off,off,off,on,off
/post1
eall
nall
/com,
/com, This routine selects the nodes at the centerlines of the perimeter casks
/com,   and prints out the displacements for these nodes for all 19 load steps.
/com,
/COM
================================================================================
/COM
================================================================================
/COM
/COM ========================  SELECT NODES AT THE CL OF THE CASKS
====================
/COM
nsel,node,159
nasel,node,3022
nasel,node,3735
nasel,node,4467
nasel,node,5178
nasel,node,5890
nasel,node,6602
nasel,node,8183
nasel,node,11046
nasel,node,11759
nasel,node,12491
nasel,node,13202
nasel,node,13914
nasel,node,14626
/COM
================================================================================
/COM
================================================================================
/COM ==================================  SET 1
====================================
set,1
nsort,u,y
prdi
/COM
================================================================================
/COM
================================================================================
```

```
/COM ==================================  SET 2
=====================================
set,2
nsort,u,y
prdi
/COM
==================================================================================
/COM
==================================================================================
/COM ==================================  SET 3
=====================================
set,3
nsort,u,y
prdi
/COM
==================================================================================
/COM
==================================================================================
/COM ==================================  SET 4
=====================================
set,4
nsort,u,y
prdi
/COM
==================================================================================
/COM
==================================================================================
/COM ==================================  SET 5
=====================================
set,5
nsort,u,y
prdi
/COM
==================================================================================
/COM
==================================================================================
fini
/output
/exit
```

Below is the ANSYS output file for the maximum cask displacements for the soft rock analyses with adjusted LTSP loads:

```
CURRENT JOBNAME REDEFINED AS dcslabs2a

RESUME ANSYS DATA FROM FILE NAME=dcslabs2a.db

*** ANSYS GLOBAL STATUS ***

TITLE = Pad, ADJ LTSP(2), 20 Casks, 462 Kips West (X), Soft Rock
ANALYSIS TYPE =  STATIC (STEADY-STATE)
NUMBER OF ELEMENT TYPES =      6
   9056 ELEMENTS CURRENTLY SELECTED.  MAX ELEMENT NUMBER =    33177
  11550 NODES CURRENTLY SELECTED.     MAX NODE NUMBER =       17051
    259 KEYPOINTS CURRENTLY SELECTED. MAX KEYPOINT NUMBER =     259
    250 LINES CURRENTLY SELECTED.     MAX LINE NUMBER =         396
    181 AREAS CURRENTLY SELECTED.     MAX AREA NUMBER =         295
     70 VOLUMES CURRENTLY SELECTED.   MAX VOL. NUMBER =          70
    11 COMPONENTS CURRENTLY DEFINED
MAXIMUM LINEAR PROPERTY NUMBER        =       5
MAXIMUM REAL CONSTANT SET NUMBER      =       6
ACTIVE COORDINATE SYSTEM              =       0  (CARTESIAN)
MAXIMUM CONSTRAINT EQUATION NUMBER    =    4620
NUMBER OF SPECIFIED CONSTRAINTS       =    2193
NUMBER OF NODAL LOADS                 =    2160

INITIAL JOBNAME = dcslabs2a
CURRENT JOBNAME = dcslabs2a


PRINT HEADER
DO NOT PRINT SUBTITLE(S)
DO NOT PRINT LOAD STEP ID
DO NOT PRINT NOTE LINE(S)
PRINT COLUMN HEADER LABELS
DO NOT PRINT REPORT TOTALS
1

***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7     *****
ANSYS/Structural U
00150104          VERSION=INTEL NT      19:02:34  NOV 24, 2001 CP=      0.921

Pad, ADJ LTSP(2), 20 Casks, 462 Kips West (X), Soft Rock


         ***** ANSYS RESULTS INTERPRETATION (POST1) *****

*** NOTE ***                            CP=      0.921   TIME= 19:02:34
Reading results into the database (SET command) will update the current
 displacement and force boundary conditions in the database with the
 values from the results file for that load set.  Note that any
 subsequent solutions will use these values unless action is taken to
```

```
either SAVE the current values or not overwrite them (/EXIT,NOSAVE).

  15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

  17051  NODES (OF    17051  DEFINED) SELECTED BY NALL  COMMAND.

This routine selects the nodes at the centerlines of the perimeter casks
  and prints out the displacements for these nodes for all 19 load steps.

================================================================================
================================================================================

========================  SELECT NODES AT THE CL OF THE CASKS =================

NSEL  FOR LABEL= NODE  FROM   159 TO   159 BY    1

       1  NODES (OF    17051  DEFINED) SELECTED BY  NSEL  COMMAND.

NASE  FOR LABEL= NODE  FROM  3022 TO  3022 BY    1

       2  NODES (OF    17051  DEFINED) SELECTED BY  NASE  COMMAND.

NASE  FOR LABEL= NODE  FROM  3735 TO  3735 BY    1

       3  NODES (OF    17051  DEFINED) SELECTED BY  NASE  COMMAND.

NASE  FOR LABEL= NODE  FROM  4467 TO  4467 BY    1

       4  NODES (OF    17051  DEFINED) SELECTED BY  NASE  COMMAND.

NASE  FOR LABEL= NODE  FROM  5178 TO  5178 BY    1

       5  NODES (OF    17051  DEFINED) SELECTED BY  NASE  COMMAND.

NASE  FOR LABEL= NODE  FROM  5890 TO  5890 BY    1

       6  NODES (OF    17051  DEFINED) SELECTED BY  NASE  COMMAND.

NASE  FOR LABEL= NODE  FROM  6602 TO  6602 BY    1

       7  NODES (OF    17051  DEFINED) SELECTED BY  NASE  COMMAND.

NASE  FOR LABEL= NODE  FROM  8183 TO  8183 BY    1

       8  NODES (OF    17051  DEFINED) SELECTED BY  NASE  COMMAND.

NASE  FOR LABEL= NODE  FROM 11046 TO 11046 BY    1

       9  NODES (OF    17051  DEFINED) SELECTED BY  NASE  COMMAND.

NASE  FOR LABEL= NODE  FROM 11759 TO 11759 BY    1
```

```
      10  NODES (OF    17051  DEFINED) SELECTED BY  NASE  COMMAND.

NASE  FOR LABEL= NODE  FROM 12491 TO 12491 BY    1

      11  NODES (OF    17051  DEFINED) SELECTED BY  NASE  COMMAND.

NASE  FOR LABEL= NODE  FROM 13202 TO 13202 BY    1

      12  NODES (OF    17051  DEFINED) SELECTED BY  NASE  COMMAND.

NASE  FOR LABEL= NODE  FROM 13914 TO 13914 BY    1

      13  NODES (OF    17051  DEFINED) SELECTED BY  NASE  COMMAND.

NASE  FOR LABEL= NODE  FROM 14626 TO 14626 BY    1

      14  NODES (OF    17051  DEFINED) SELECTED BY  NASE  COMMAND.
================================================================================
================================================================================
==================================  SET 1  ==================================

USE LOAD STEP     1  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     1  SUBSTEP=     1  CUMULATIVE ITERATION=    13
  TIME/FREQUENCY=  1.0000
TITLE= Pad, ADJ LTSP(2), 20 Casks, 462 Kips North (Z), Soft Rock

SORT ON ITEM=U     COMPONENT=Y     ORDER= 0  KABS= 0  NMAX=   17051

SORT COMPLETED FOR      14 VALUES.

PRINT DOF  NODAL SOLUTION PER NODE
1

***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7     *****
ANSYS/Structural U
00150104          VERSION=INTEL NT      19:02:37  NOV 24, 2001 CP=      3.295

Pad, ADJ LTSP(2), 20 Casks, 462 Kips North (Z), Soft Rock


   NODE      UX          UY          UZ
  14626  0.17038E-02 0.55719E-03 0.52616E-01
   6602 -0.17038E-02 0.55719E-03 0.52616E-01
  11046  0.81406E-03-0.28650E-02 0.54400E-01
   3022 -0.81406E-03-0.28650E-02 0.54400E-01
  13914  0.18437E-02-0.20925E-01 0.47206E-01
   5890 -0.18437E-02-0.20925E-01 0.47206E-01
  11759  0.15538E-02-0.23590E-01 0.41286E-01
   3735 -0.15538E-02-0.23590E-01 0.41286E-01
  12491  0.21411E-02-0.25018E-01 0.43281E-01
   4467 -0.21411E-02-0.25018E-01 0.43281E-01
```

```
  13202  0.21699E-02-0.25193E-01 0.44914E-01
   5178 -0.21699E-02-0.25193E-01 0.44914E-01
   8183  0.47251E-03-0.29111E-01 0.43129E-01
    159 -0.47252E-03-0.29111E-01 0.43129E-01
================================================================================
================================================================================
=================================  SET 2  =================================


USE LOAD STEP.    2  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     2  SUBSTEP=     1  CUMULATIVE ITERATION=    22
  TIME/FREQUENCY=  2.0000
TITLE= Pad, ADJ LTSP(2), 20 Casks, 462 Kips N 32.93 W (Z,X), Soft Rock

SORT ON ITEM=U     COMPONENT=Y     ORDER= 0  KABS= 0  NMAX=   17051

SORT COMPLETED FOR      14 VALUES.

PRINT DOF  NODAL SOLUTION PER NODE
1

***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7     *****
ANSYS/Structural U
00150104          VERSION=INTEL NT      19:02:39  NOV 24, 2001 CP=      5.538

Pad, ADJ LTSP(2), 20 Casks, 462 Kips N 32.93 W (Z,X), Soft Rock


   NODE      UX          UY          UZ
  14626  0.31642E-01 0.20563E-01 0.48010E-01
  11046  0.27969E-01-0.22153E-02 0.46586E-01
  13914  0.31417E-01-0.78609E-02 0.42367E-01
   3022  0.25052E-01-0.11387E-01 0.44124E-01
   6602  0.24369E-01-0.15959E-01 0.39981E-01
  13202  0.30686E-01-0.16626E-01 0.38131E-01
  11759  0.25979E-01-0.17509E-01 0.32848E-01
  12491  0.29151E-01-0.17957E-01 0.35227E-01
   8183  0.24009E-01-0.27258E-01 0.35384E-01
   3735  0.22474E-01-0.27339E-01 0.35782E-01
   5890  0.25266E-01-0.28195E-01 0.38092E-01
    159  0.22937E-01-0.29020E-01 0.36132E-01
   4467  0.24323E-01-0.30231E-01 0.37133E-01
   5178  0.25314E-01-0.30931E-01 0.37637E-01
================================================================================
================================================================================
=================================  SET 3  =================================


USE LOAD STEP     3  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     3  SUBSTEP=     1  CUMULATIVE ITERATION=    26
  TIME/FREQUENCY=  3.0000
```

```
TITLE= Pad, ADJ LTSP(2), 20 Casks, 462 Kips N 45 W (Z,X), Soft Rock

SORT ON ITEM=U     COMPONENT=Y     ORDER= 0  KABS= 0  NMAX=   17051

SORT COMPLETED FOR      14 VALUES.

PRINT DOF  NODAL SOLUTION PER NODE
1

***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7     *****
ANSYS/Structural U
00150104          VERSION=INTEL NT      19:02:42  NOV 24, 2001 CP=      7.781

Pad, ADJ LTSP(2), 20 Casks, 462 Kips N 45 W (Z,X), Soft Rock


   NODE      UX          UY          UZ
  14626  0.41151E-01 0.24791E-01 0.41306E-01
  13914  0.41554E-01-0.87883E-03 0.36556E-01
  11046  0.36107E-01-0.48838E-02 0.39258E-01
  13202  0.40763E-01-0.10358E-01 0.32403E-01
  12491  0.38585E-01-0.12805E-01 0.29339E-01
  11759  0.34358E-01-0.13403E-01 0.27001E-01
   3022  0.32412E-01-0.15708E-01 0.36509E-01
   6602  0.31496E-01-0.20216E-01 0.32507E-01
   8183  0.31516E-01-0.26033E-01 0.29303E-01
   3735  0.29884E-01-0.28117E-01 0.30424E-01
    159  0.30197E-01-0.28575E-01 0.30185E-01
   5890  0.33337E-01-0.30182E-01 0.31619E-01
   4467  0.32454E-01-0.31723E-01 0.31507E-01
   5178  0.33678E-01-0.32628E-01 0.31641E-01
================================================================================
================================================================================
==================================  SET 4  ==================================


USE LOAD STEP     4  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     4  SUBSTEP=     1  CUMULATIVE ITERATION=    31
  TIME/FREQUENCY=  4.0000
TITLE= Pad, ADJ LTSP(2), 20 Casks, 462 Kips N 57.07 W (Z,X), Soft Rock

SORT ON ITEM=U     COMPONENT=Y     ORDER= 0  KABS= 0  NMAX=   17051

SORT COMPLETED FOR      14 VALUES.

PRINT DOF  NODAL SOLUTION PER NODE
1

***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7     *****
ANSYS/Structural U
00150104          VERSION=INTEL NT      19:02:44  NOV 24, 2001 CP=     10.004
```

Pad, ADJ LTSP(2), 20 Casks, 462 Kips N 57.07 W (Z,X), Soft Rock

NODE	UX	UY	UZ
14626	0.48529E-01	0.25529E-01	0.32523E-01
13914	0.49823E-01	0.53722E-02	0.28797E-01
13202	0.49319E-01	-0.34263E-02	0.25196E-01
12491	0.46792E-01	-0.67905E-02	0.22155E-01
11759	0.41835E-01	-0.82002E-02	0.19911E-01
11046	0.42287E-01	-0.86321E-02	0.30213E-01
3022	0.38003E-01	-0.19524E-01	0.27698E-01
6602	0.37093E-01	-0.23242E-01	0.24224E-01
8183	0.37866E-01	-0.24485E-01	0.21865E-01
159	0.36181E-01	-0.27908E-01	0.22802E-01
3735	0.35961E-01	-0.28513E-01	0.23603E-01
5890	0.39800E-01	-0.31750E-01	0.23902E-01
4467	0.39087E-01	-0.32879E-01	0.24426E-01
5178	0.40440E-01	-0.33998E-01	0.24252E-01

==========
==========
========== SET 5 ==========

USE LOAD STEP 5 SUBSTEP 0 FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP= 5 SUBSTEP= 1 CUMULATIVE ITERATION= 39
TIME/FREQUENCY= 5.0000
TITLE= Pad, ADJ LTSP(2), 20 Casks, 462 Kips West (X), Soft Rock

SORT ON ITEM=U COMPONENT=Y ORDER= 0 KABS= 0 NMAX= 17051

SORT COMPLETED FOR 14 VALUES.

PRINT DOF NODAL SOLUTION PER NODE
1

***** ANSYS - ENGINEERING ANALYSIS SYSTEM RELEASE 5.7 *****
ANSYS/Structural U
00150104 VERSION=INTEL NT 19:02:46 NOV 24, 2001 CP= 12.238

Pad, ADJ LTSP(2), 20 Casks, 462 Kips West (X), Soft Rock

NODE	UX	UY	UZ
14626	0.54494E-01	0.11852E-01	0.46345E-02
11759	0.54488E-01	0.11804E-01	-0.46269E-02
13914	0.58734E-01	0.85260E-02	0.25566E-02
12491	0.58730E-01	0.85061E-02	-0.25501E-02
13202	0.60171E-01	0.74965E-02	0.87796E-04
11046	0.47441E-01	-0.18196E-01	0.29799E-02
8183	0.47432E-01	-0.18217E-01	-0.29740E-02
3022	0.44116E-01	-0.25053E-01	0.17962E-02
159	0.44112E-01	-0.25056E-01	-0.17940E-02

```
   3735  0.43765E-01-0.27548E-01 0.33653E-03
   6602  0.43766E-01-0.27549E-01-0.33471E-03
   4467  0.47460E-01-0.33963E-01 0.59418E-03
   5890  0.47460E-01-0.33963E-01-0.59230E-03
   5178  0.48691E-01-0.35737E-01-0.27199E-04
================================================================================
================================================================================

EXIT THE ANSYS POST1 DATABASE PROCESSOR

***** ROUTINE COMPLETED *****  CP =        12.248
```

PAD X and Z STRESSES

Below is the ANSYS input file that scans the database for the max/min X and Z stresses for the soft rock model with adjusted LTSP loads:

```
/COM
/OUTPUT,padsoftastress.out
/COM
/COM     STRESS DATA SORTED AND PRINTED BY LOAD STEP
/COM
/COM
/COM
/COM     THIS ROUTINE SORTS AND PRINTS STRESS DATA BY LOAD STEP
/COM     FIRST SX AND THEN SZ
/COM
/com  SOFT ROCK RESULTS
/COM
/file,dcslabs2a
resume
/header,on,off,off,off,on,off
/post1
/COM
EALL
NALL
/COM
/COM ==============================================================================
/COM ==============================================================================
/COM ==============================================================================
/COM ================================  SET 1  ====================================
/COM
SET,1
ESEL,TYPE,1
NELEM
/COM
/COM ==============================================================================
/COM =======================    MAXIMUM VALUES OF SX    ===========================
/COM
NSORT,S,X,0,0,2,SEL
PRNSOL,S
NUSORT
/COM
/COM ==============================================================================
/COM =======================    MINIMUM VALUES OF SX    ===========================
/COM
NSORT,S,X,1,0,2,SEL
PRNSOL,S
NUSORT
/COM
/COM ==============================================================================
/COM =======================    MAXIMUM VALUES OF SZ    ===========================
/COM
NSORT,S,Z,0,0,2,SEL
PRNSOL,S
```

```
NUSORT
/COM
/COM ==============================================================================
/COM =======================    MINIMUM VALUES OF SZ    ============================
/COM
NSORT,S,Z,1,0,2,SEL
PRNSOL,S
/COM
/COM ==============================================================================
/COM ==============================================================================
/COM ==============================================================================
/COM ==================================  SET 2  ====================================
/COM
SET,2
ESEL,TYPE,1
NELEM
/COM
/COM ==============================================================================
/COM =======================    MAXIMUM VALUES OF SX    ============================
/COM
NSORT,S,X,0,0,2,SEL
PRNSOL,S
NUSORT
/COM
/COM ==============================================================================
/COM =======================    MINIMUM VALUES OF SX    ============================
/COM
NSORT,S,X,1,0,2,SEL
PRNSOL,S
NUSORT
/COM
/COM ==============================================================================
/COM =======================    MAXIMUM VALUES OF SZ    ============================
/COM
NSORT,S,Z,0,0,2,SEL
PRNSOL,S
NUSORT
/COM
/COM ==============================================================================
/COM =======================    MINIMUM VALUES OF SZ    ============================
/COM
NSORT,S,Z,1,0,2,SEL
PRNSOL,S
/COM
/COM ==============================================================================
/COM ==============================================================================
/COM ==============================================================================
/COM ==================================  SET 3  ====================================
/COM
SET,3
ESEL,TYPE,1
NELEM
/COM
```

```
/COM ==============================================================================
/COM =======================    MAXIMUM VALUES OF SX    ============================
/COM
NSORT,S,X,0,0,2,SEL
PRNSOL,S
NUSORT
/COM
/COM ==============================================================================
/COM =======================    MINIMUM VALUES OF SX    ============================
/COM
NSORT,S,X,1,0,2,SEL
PRNSOL,S
NUSORT
/COM
/COM ==============================================================================
/COM =======================    MAXIMUM VALUES OF SZ    ============================
/COM
NSORT,S,Z,0,0,2,SEL
PRNSOL,S
NUSORT
/COM
/COM ==============================================================================
/COM =======================    MINIMUM VALUES OF SZ    ============================
/COM
NSORT,S,Z,1,0,2,SEL
PRNSOL,S
/COM
/COM ==============================================================================
/COM ==============================================================================
/COM ==============================================================================
/COM ================================  SET 4  =====================================
/COM
SET,4
ESEL,TYPE,1
NELEM
/COM
/COM ==============================================================================
/COM =======================    MAXIMUM VALUES OF SX    ============================
/COM
NSORT,S,X,0,0,2,SEL
PRNSOL,S
NUSORT
/COM
/COM ==============================================================================
/COM =======================    MINIMUM VALUES OF SX    ============================
/COM
NSORT,S,X,1,0,2,SEL
PRNSOL,S
NUSORT
/COM
/COM ==============================================================================
/COM =======================    MAXIMUM VALUES OF SZ    ============================
/COM
```

```
NSORT,S,Z,0,0,2,SEL
PRNSOL,S
NUSORT
/COM
/COM ==============================================================================
/COM =======================    MINIMUM VALUES OF SZ    ============================
/COM
NSORT,S,Z,1,0,2,SEL
PRNSOL,S
/COM
/COM ==============================================================================
/COM ==============================================================================
/COM ==============================================================================
/COM ================================  SET 5  ====================================
/COM
SET,5
ESEL,TYPE,1
NELEM
/COM
/COM ==============================================================================
/COM =======================    MAXIMUM VALUES OF SX    ============================
/COM
NSORT,S,X,0,0,2,SEL
PRNSOL,S
NUSORT
/COM
/COM ==============================================================================
/COM =======================    MINIMUM VALUES OF SX    ============================
/COM
NSORT,S,X,1,0,2,SEL
PRNSOL,S
NUSORT
/COM
/COM ==============================================================================
/COM =======================    MAXIMUM VALUES OF SZ    ============================
/COM
NSORT,S,Z,0,0,2,SEL
PRNSOL,S
NUSORT
/COM
/COM ==============================================================================
/COM =======================    MINIMUM VALUES OF SZ    ============================
/COM
NSORT,S,Z,1,0,2,SEL
PRNSOL,S
/COM
/COM ==============================================================================
/COM ==============================================================================
/COM ==============================================================================
/COM
EALL
NALL
FINI
```

```
/OUTPUT
/EXIT
```

Below is the ANSYS output file for pad X and Z stresses for the soft rock analyses with adjusted LTSP loads:

```
     STRESS DATA SORTED AND PRINTED BY LOAD STEP



     THIS ROUTINE SORTS AND PRINTS STRESS DATA BY LOAD STEP
     FIRST SX AND THEN SZ

  SOFT ROCK RESULTS


 CURRENT JOBNAME REDEFINED AS dcslabs2a

 RESUME ANSYS DATA FROM FILE NAME=dcslabs2a.db

 *** ANSYS GLOBAL STATUS ***

 TITLE = Pad, ADJ LTSP(2), 20 Casks, 462 Kips West (X), Soft Rock
 ANALYSIS TYPE =  STATIC (STEADY-STATE)
 NUMBER OF ELEMENT TYPES =      6
   15348 ELEMENTS CURRENTLY SELECTED.  MAX ELEMENT NUMBER =    33177
      14 NODES CURRENTLY SELECTED.     MAX NODE NUMBER =       17051
     259 KEYPOINTS CURRENTLY SELECTED. MAX KEYPOINT NUMBER =     259
     250 LINES CURRENTLY SELECTED.     MAX LINE NUMBER =         396
     181 AREAS CURRENTLY SELECTED.     MAX AREA NUMBER =         295
      70 VOLUMES CURRENTLY SELECTED.   MAX VOL. NUMBER =          70
     11 COMPONENTS CURRENTLY DEFINED
 MAXIMUM LINEAR PROPERTY NUMBER        =       5
 MAXIMUM REAL CONSTANT SET NUMBER      =       6
 ACTIVE COORDINATE SYSTEM              =       0  (CARTESIAN)
 MAXIMUM CONSTRAINT EQUATION NUMBER    =    4620
 NUMBER OF SPECIFIED CONSTRAINTS       =    2193
 NUMBER OF NODAL LOADS                 =    2160

 INITIAL JOBNAME = dcslabs2a
 CURRENT JOBNAME = dcslabs2a


 PRINT HEADER
 DO NOT PRINT SUBTITLE(S)
 DO NOT PRINT LOAD STEP ID
 DO NOT PRINT NOTE LINE(S)
 PRINT COLUMN HEADER LABELS
 DO NOT PRINT REPORT TOTALS
1

 ***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7     *****
 ANSYS/Structural U
 00150104          VERSION=INTEL NT      19:08:51  NOV 24, 2001 CP=      0.881

 Pad, ADJ LTSP(2), 20 Casks, 462 Kips West (X), Soft Rock
```

```
          ***** ANSYS RESULTS INTERPRETATION (POST1) *****

 *** NOTE ***                            CP=      0.881   TIME= 19:08:51
 Reading results into the database (SET command) will update the current
  displacement and force boundary conditions in the database with the
  values from the results file for that load set.  Note that any
  subsequent solutions will use these values unless action is taken to
  either SAVE the current values or not overwrite them (/EXIT,NOSAVE).


    15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

    17051  NODES (OF    17051  DEFINED) SELECTED BY NALL  COMMAND.

 ==============================================================================
 ==============================================================================
 ==============================================================================
 ================================  SET 1  ====================================



 USE LOAD STEP     1  SUBSTEP     0  FOR LOAD CASE 0

 SET COMMAND GOT LOAD STEP=     1  SUBSTEP=     1  CUMULATIVE ITERATION=    13
   TIME/FREQUENCY=  1.0000
 TITLE= Pad, ADJ LTSP(2), 20 Casks, 462 Kips North (Z), Soft Rock

 ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

     9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

 SELECT      ALL NODES HAVING ANY ELEMENT IN ELEMENT SET.

    11550 NODES (OF    17051  DEFINED) SELECTED FROM
     9056 SELECTED ELEMENTS BY NELE COMMAND.

 ==============================================================================
 =======================    MAXIMUM VALUES OF SX    ============================


 SORT ON ITEM=S     COMPONENT=X     ORDER= 0  KABS= 0  NMAX=       2

 SORT COMPLETED FOR       2 VALUES.

 PRINT S    NODAL SOLUTION PER NODE
1

 ***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7     *****
 ANSYS/Structural U
 00150104          VERSION=INTEL NT      19:08:55  NOV 24, 2001 CP=      4.386
```

Pad, ADJ LTSP(2), 20 Casks, 462 Kips North (Z), Soft Rock

NODE	SX	SY	SZ	SXY	SYZ	SXZ
7365	44.982	-17.165	-5.0038	3.0381	34.508	-7.8936
15379	44.982	-17.165	-5.0038	-3.0381	34.508	7.8936

NODE SORT REMOVED

==========
========== MINIMUM VALUES OF SX ==========

SORT ON ITEM=S COMPONENT=X ORDER= 1 KABS= 0 NMAX= 2

SORT COMPLETED FOR 2 VALUES.

PRINT S NODAL SOLUTION PER NODE
1

***** ANSYS - ENGINEERING ANALYSIS SYSTEM RELEASE 5.7 *****
ANSYS/Structural U
00150104 VERSION=INTEL NT 19:08:55 NOV 24, 2001 CP= 4.567

Pad, ADJ LTSP(2), 20 Casks, 462 Kips North (Z), Soft Rock

NODE	SX	SY	SZ	SXY	SYZ	SXZ
3061	-98.307	-204.49	-69.888	0.28832	-18.462	-5.7487
11085	-98.307	-204.49	-69.888	-0.28832	-18.462	5.7487

NODE SORT REMOVED

==========
========== MAXIMUM VALUES OF SZ ==========

SORT ON ITEM=S COMPONENT=Z ORDER= 0 KABS= 0 NMAX= 2

SORT COMPLETED FOR 2 VALUES.

PRINT S NODAL SOLUTION PER NODE
1

***** ANSYS - ENGINEERING ANALYSIS SYSTEM RELEASE 5.7 *****
ANSYS/Structural U
00150104 VERSION=INTEL NT 19:08:55 NOV 24, 2001 CP= 4.747

Pad, ADJ LTSP(2), 20 Casks, 462 Kips North (Z), Soft Rock

NODE	SX	SY	SZ	SXY	SYZ	SXZ
7439	-6.0158	-68.739	264.99	18.153	124.54	-108.43

```
  15443  -6.0158     -68.739      264.99     -18.153      124.54      108.43

NODE SORT REMOVED

================================================================================
=======================    MINIMUM VALUES OF SZ    ============================


SORT ON ITEM=S     COMPONENT=Z     ORDER= 1  KABS= 0  NMAX=       2

SORT COMPLETED FOR       2 VALUES.

PRINT S    NODAL SOLUTION PER NODE
1

***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7     *****
ANSYS/Structural U
00150104          VERSION=INTEL NT      19:08:56  NOV 24, 2001 CP=      4.937

Pad, ADJ LTSP(2), 20 Casks, 462 Kips North (Z), Soft Rock


   NODE    SX          SY          SZ          SXY         SYZ         SXZ
   7349  -82.224     -208.70     -392.39      58.365      247.31     -166.77
  15363  -82.224     -208.70     -392.39     -58.365      247.31      166.77

================================================================================
================================================================================
================================================================================
=================================  SET 2  ======================================


USE LOAD STEP     2  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     2  SUBSTEP=     1  CUMULATIVE ITERATION=    22
  TIME/FREQUENCY=  2.0000
TITLE= Pad, ADJ LTSP(2), 20 Casks, 462 Kips N 32.93 W (Z,X), Soft Rock

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      ALL NODES HAVING ANY ELEMENT IN ELEMENT SET.

   11550 NODES (OF    17051  DEFINED) SELECTED FROM
    9056 SELECTED ELEMENTS BY NELE COMMAND.

================================================================================
=======================    MAXIMUM VALUES OF SX    ============================


SORT ON ITEM=S     COMPONENT=X     ORDER= 0  KABS= 0  NMAX=       2
```

```
SORT COMPLETED FOR        2 VALUES.

PRINT S    NODAL SOLUTION PER NODE
1

***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7     *****
ANSYS/Structural U
00150104          VERSION=INTEL NT      19:08:59  NOV 24, 2001 CP=      8.432

Pad, ADJ LTSP(2), 20 Casks, 462 Kips N 32.93 W (Z,X), Soft Rock

   NODE     SX          SY          SZ          SXY         SYZ         SXZ
  13630   142.10     -38.018     4.3870      21.490      125.75      114.93
  14342   140.94     -38.109     63.683      21.332      125.90      121.34

NODE SORT REMOVED

================================================================================
=======================    MINIMUM VALUES OF SX    ============================

SORT ON ITEM=S     COMPONENT=X     ORDER= 1  KABS= 0  NMAX=       2

SORT COMPLETED FOR        2 VALUES.

PRINT S    NODAL SOLUTION PER NODE
1

***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7     *****
ANSYS/Structural U
00150104          VERSION=INTEL NT      19:09:00  NOV 24, 2001 CP=      8.612

Pad, ADJ LTSP(2), 20 Casks, 462 Kips N 32.93 W (Z,X), Soft Rock

   NODE     SX          SY          SZ          SXY         SYZ         SXZ
   7349  -262.27     -322.65     -395.86      161.54      269.44     -213.56
   5603  -236.30     -152.21     -32.443      85.262      136.66     -117.64

NODE SORT REMOVED

================================================================================
=======================    MAXIMUM VALUES OF SZ    ============================

SORT ON ITEM=S     COMPONENT=Z     ORDER= 0  KABS= 0  NMAX=       2

SORT COMPLETED FOR        2 VALUES.

PRINT S    NODAL SOLUTION PER NODE
1
```

```
***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7     *****
ANSYS/Structural U
00150104          VERSION=INTEL NT      19:09:00  NOV 24, 2001 CP=      8.803

Pad, ADJ LTSP(2), 20 Casks, 462 Kips N 32.93 W (Z,X), Soft Rock


   NODE    SX          SY          SZ          SXY         SYZ         SXZ
  15443   120.68     -95.849      229.98      28.161      108.93      141.54
  15446   90.027    -0.50675      222.98      31.283     -1.0958      94.376

NODE SORT REMOVED

==============================================================================
=======================    MINIMUM VALUES OF SZ    ============================


SORT ON ITEM=S     COMPONENT=Z     ORDER= 1  KABS= 0  NMAX=       2

SORT COMPLETED FOR       2 VALUES.

PRINT S    NODAL SOLUTION PER NODE
1

***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7     *****
ANSYS/Structural U
00150104          VERSION=INTEL NT      19:09:00  NOV 24, 2001 CP=      8.963

Pad, ADJ LTSP(2), 20 Casks, 462 Kips N 32.93 W (Z,X), Soft Rock


   NODE    SX          SY          SZ          SXY         SYZ         SXZ
   7349  -262.27     -322.65     -395.86      161.54      269.44     -213.56
   7351  -126.48      23.795     -312.81      105.69     -15.915     -130.24

==============================================================================
==============================================================================
==============================================================================
================================  SET 3  ====================================


USE LOAD STEP     3  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     3  SUBSTEP=     1  CUMULATIVE ITERATION=    26
  TIME/FREQUENCY=  3.0000
TITLE= Pad, ADJ LTSP(2), 20 Casks, 462 Kips N 45 W (Z,X), Soft Rock

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.
```

```
SELECT      ALL NODES HAVING ANY ELEMENT IN ELEMENT SET.

   11550 NODES (OF    17051  DEFINED) SELECTED FROM
    9056 SELECTED ELEMENTS BY NELE COMMAND.

================================================================================
=======================    MAXIMUM VALUES OF SX    ============================

SORT ON ITEM=S     COMPONENT=X     ORDER= 0  KABS= 0  NMAX=       2

SORT COMPLETED FOR       2 VALUES.

PRINT S    NODAL SOLUTION PER NODE
1

***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7     *****
ANSYS/Structural U
00150104          VERSION=INTEL NT      19:09:04  NOV 24, 2001 CP=     12.468

Pad, ADJ LTSP(2), 20 Casks, 462 Kips N 45 W (Z,X), Soft Rock

   NODE     SX          SY          SZ          SXY         SYZ         SXZ
  13630   189.27     -51.067      1.3192      26.536      95.931      99.796
  13512   188.95      15.658      15.682      17.143      11.579      93.521

NODE SORT REMOVED

================================================================================
=======================    MINIMUM VALUES OF SX    ============================

SORT ON ITEM=S     COMPONENT=X     ORDER= 1  KABS= 0  NMAX=       2

SORT COMPLETED FOR       2 VALUES.

PRINT S    NODAL SOLUTION PER NODE
1

***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7     *****
ANSYS/Structural U
00150104          VERSION=INTEL NT      19:09:04  NOV 24, 2001 CP=     12.658

Pad, ADJ LTSP(2), 20 Casks, 462 Kips N 45 W (Z,X), Soft Rock

   NODE     SX          SY          SZ          SXY         SYZ         SXZ
   7349  -311.46     -329.74     -365.28      186.98      252.46     -216.08
   5603  -292.43     -176.52     -34.001      101.20      112.23     -101.54

NODE SORT REMOVED
```

```
==============================================================================
=======================    MAXIMUM VALUES OF SZ    ============================

SORT ON ITEM=S     COMPONENT=Z     ORDER= 0  KABS= 0  NMAX=       2

SORT COMPLETED FOR       2 VALUES.

PRINT S    NODAL SOLUTION PER NODE
1

***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7     *****
ANSYS/Structural U
00150104          VERSION=INTEL NT      19:09:05  NOV 24, 2001 CP=     12.828

Pad, ADJ LTSP(2), 20 Casks, 462 Kips N 45 W (Z,X), Soft Rock
```

NODE	SX	SY	SZ	SXY	SYZ	SXZ
15443	157.98	-98.851	203.66	42.333	97.205	142.93
15446	119.12	5.8000	195.90	45.043	-2.4698	99.853

```
NODE SORT REMOVED

==============================================================================
=======================    MINIMUM VALUES OF SZ    ============================

SORT ON ITEM=S     COMPONENT=Z     ORDER= 1  KABS= 0  NMAX=       2

SORT COMPLETED FOR       2 VALUES.

PRINT S    NODAL SOLUTION PER NODE
1

***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7     *****
ANSYS/Structural U
00150104          VERSION=INTEL NT      19:09:05  NOV 24, 2001 CP=     13.019

Pad, ADJ LTSP(2), 20 Casks, 462 Kips N 45 W (Z,X), Soft Rock
```

NODE	SX	SY	SZ	SXY	SYZ	SXZ
7349	-311.46	-329.74	-365.28	186.98	252.46	-216.08
7351	-157.82	31.972	-276.61	128.27	-20.904	-138.92

```
==============================================================================
==============================================================================
==============================================================================
================================  SET 4  =====================================
```

```
USE LOAD STEP     4  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     4  SUBSTEP=     1  CUMULATIVE ITERATION=    31
  TIME/FREQUENCY=  4.0000
TITLE= Pad, ADJ LTSP(2), 20 Casks, 462 Kips N 57.07 W (Z,X), Soft Rock

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      ALL NODES HAVING ANY ELEMENT IN ELEMENT SET.

   11550 NODES (OF    17051  DEFINED) SELECTED FROM
    9056 SELECTED ELEMENTS BY NELE COMMAND.

==============================================================================
=======================    MAXIMUM VALUES OF SX    ============================

SORT ON ITEM=S     COMPONENT=X     ORDER= 0  KABS= 0  NMAX=       2

SORT COMPLETED FOR       2 VALUES.

PRINT S    NODAL SOLUTION PER NODE
1

***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7     *****
ANSYS/Structural U
00150104          VERSION=INTEL NT      19:09:09  NOV 24, 2001 CP=     16.534

Pad, ADJ LTSP(2), 20 Casks, 462 Kips N 57.07 W (Z,X), Soft Rock
```

NODE	SX	SY	SZ	SXY	SYZ	SXZ
15364	229.88	-34.056	-79.162	9.0156	61.181	29.609
15363	226.29	-22.203	-136.19	92.207	68.397	-12.057

```
NODE SORT REMOVED

==============================================================================
=======================    MINIMUM VALUES OF SX    ============================

SORT ON ITEM=S     COMPONENT=X     ORDER= 1  KABS= 0  NMAX=       2

SORT COMPLETED FOR       2 VALUES.

PRINT S    NODAL SOLUTION PER NODE
1

***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7     *****
ANSYS/Structural U
00150104          VERSION=INTEL NT      19:09:09  NOV 24, 2001 CP=     16.724
```

Pad, ADJ LTSP(2), 20 Casks, 462 Kips N 57.07 W (Z,X), Soft Rock

NODE	SX	SY	SZ	SXY	SYZ	SXZ
7349	-348.48	-311.57	-316.84	200.86	222.68	-210.37
5603	-337.44	-197.39	-34.665	114.03	82.921	-80.924

NODE SORT REMOVED

==========
========== MAXIMUM VALUES OF SZ ==========

SORT ON ITEM=S COMPONENT=Z ORDER= 0 KABS= 0 NMAX= 2

SORT COMPLETED FOR 2 VALUES.

PRINT S NODAL SOLUTION PER NODE
1

***** ANSYS - ENGINEERING ANALYSIS SYSTEM RELEASE 5.7 *****
ANSYS/Structural U
00150104 VERSION=INTEL NT 19:09:09 NOV 24, 2001 CP= 16.894

Pad, ADJ LTSP(2), 20 Casks, 462 Kips N 57.07 W (Z,X), Soft Rock

NODE	SX	SY	SZ	SXY	SYZ	SXZ
15443	190.31	-98.341	170.67	55.290	82.107	138.96
15446	144.92	12.005	162.37	57.623	-3.8773	101.17

NODE SORT REMOVED

==========
========== MINIMUM VALUES OF SZ ==========

SORT ON ITEM=S COMPONENT=Z ORDER= 1 KABS= 0 NMAX= 2

SORT COMPLETED FOR 2 VALUES.

PRINT S NODAL SOLUTION PER NODE
1

***** ANSYS - ENGINEERING ANALYSIS SYSTEM RELEASE 5.7 *****
ANSYS/Structural U
00150104 VERSION=INTEL NT 19:09:10 NOV 24, 2001 CP= 17.085

Pad, ADJ LTSP(2), 20 Casks, 462 Kips N 57.07 W (Z,X), Soft Rock

NODE	SX	SY	SZ	SXY	SYZ	SXZ

7349	-348.48	-311.57	-316.84	200.86	222.68	-210.37
7351	-185.91	23.338	-230.60	146.08	-22.252	-142.08

```
================================================================================
================================================================================
================================================================================
================================  SET 5  =====================================


USE LOAD STEP     5  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     5  SUBSTEP=     1  CUMULATIVE ITERATION=    39
  TIME/FREQUENCY=  5.0000
TITLE= Pad, ADJ LTSP(2), 20 Casks, 462 Kips West (X), Soft Rock

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      ALL NODES HAVING ANY ELEMENT IN ELEMENT SET.

   11550 NODES (OF    17051  DEFINED) SELECTED FROM
    9056 SELECTED ELEMENTS BY NELE COMMAND.

================================================================================
========================    MAXIMUM VALUES OF SX    ============================


SORT ON ITEM=S     COMPONENT=X     ORDER= 0  KABS= 0  NMAX=       2

SORT COMPLETED FOR       2 VALUES.

PRINT S    NODAL SOLUTION PER NODE
1

***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7     *****
ANSYS/Structural U
00150104          VERSION=INTEL NT      19:09:13  NOV 24, 2001 CP=     20.590

Pad, ADJ LTSP(2), 20 Casks, 462 Kips West (X), Soft Rock
```

NODE	SX	SY	SZ	SXY	SYZ	SXZ
13512	258.55	24.274	-3.6547	26.884	-3.6524	-0.34504
13511	258.55	24.275	-3.6492	26.883	3.6406	0.35961

```
NODE SORT REMOVED

================================================================================
========================    MINIMUM VALUES OF SX    ============================
```

```
SORT ON ITEM=S     COMPONENT=X     ORDER= 1  KABS= 0  NMAX=       2

SORT COMPLETED FOR       2 VALUES.

PRINT S    NODAL SOLUTION PER NODE
1

***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7     *****
ANSYS/Structural U
00150104          VERSION=INTEL NT      19:09:14  NOV 24, 2001 CP=     20.770

Pad, ADJ LTSP(2), 20 Casks, 462 Kips West (X), Soft Rock


   NODE    SX          SY          SZ          SXY         SYZ         SXZ
   5603  -390.45     -229.68     -34.441      129.42     -9.6333     -10.333
   5606  -390.45     -229.68     -34.441      129.42      9.6452      10.324

NODE SORT REMOVED

================================================================================
=======================    MAXIMUM VALUES OF SZ    ============================


SORT ON ITEM=S     COMPONENT=Z     ORDER= 0  KABS= 0  NMAX=       2

SORT COMPLETED FOR       2 VALUES.

PRINT S    NODAL SOLUTION PER NODE
1

***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7     *****
ANSYS/Structural U
00150104          VERSION=INTEL NT      19:09:14  NOV 24, 2001 CP=     20.960

Pad, ADJ LTSP(2), 20 Casks, 462 Kips West (X), Soft Rock


   NODE    SX          SY          SZ          SXY         SYZ         SXZ
   6962  -17.940      7.5275      58.145     -4.1508      8.6822      7.1303
   3989  -17.942      7.5271      58.141     -4.1515     -8.6827     -7.1297

NODE SORT REMOVED

================================================================================
=======================    MINIMUM VALUES OF SZ    ============================


SORT ON ITEM=S     COMPONENT=Z     ORDER= 1  KABS= 0  NMAX=       2

SORT COMPLETED FOR       2 VALUES.

PRINT S    NODAL SOLUTION PER NODE
```

1

```
***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7      *****
ANSYS/Structural U
00150104          VERSION=INTEL NT      19:09:14  NOV 24, 2001 CP=     21.150

Pad, ADJ LTSP(2), 20 Casks, 462 Kips West (X), Soft Rock

   NODE     SX          SY          SZ          SXY         SYZ         SXZ
   7349  -375.01     -192.92     -126.74      194.55      97.624     -154.82
   7439  -375.03     -192.94     -126.73      194.56     -97.617      154.82

==============================================================================
==============================================================================
==============================================================================

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

   17051  NODES (OF    17051  DEFINED) SELECTED BY NALL  COMMAND.

EXIT THE ANSYS POST1 DATABASE PROCESSOR

***** ROUTINE COMPLETED *****  CP =        21.281
```

PAD PRINCIPAL STRESSES

Below is the ANSYS input file that scans the database for the max/min principal stresses for the soft rock model with adjusted LTSP loads:

```
/COM
/OUTPUT,padsoftaprinstress.out
/COM
/COM     STRESS DATA SORTED AND PRINTED BY LOAD STEP
/COM
/COM
/COM     THIS ROUTINE SORTS AND PRINTS PRINCIPAL STRESS DATA BY LOAD STEP
/COM     FIRST S1 AND THEN S3
/COM
/com  SOFT ROCK RESULTS
/COM
/file,dcslabs2a
resume
/header,on,off,off,off,on,off
/post1
/COM
EALL
NALL
/COM
/COM ==============================================================================
/COM ==============================================================================
/COM ==============================================================================
/COM ================================  SET 1  ====================================
/COM
SET,1
ESEL,TYPE,1
NELEM
/COM
/COM ==============================================================================
/COM =======================    MAXIMUM VALUES OF S1    ============================
/COM
NSORT,S,1,0,0,2,SEL
PRNSOL,S,PRIN
NUSORT
/COM
/COM ==============================================================================
/COM =======================    MINIMUM VALUES OF S3    ============================
/COM
NSORT,S,3,1,0,2,SEL
PRNSOL,S,PRIN
NUSORT
/COM
/COM ==============================================================================
/COM ==============================================================================
/COM ==============================================================================
/COM ================================  SET 2  ====================================
/COM
```

```
SET,2
ESEL,TYPE,1
NELEM
/COM
/COM ==============================================================================
/COM =======================    MAXIMUM VALUES OF S1    ============================
/COM
NSORT,S,1,0,0,2,SEL
PRNSOL,S,PRIN
NUSORT
/COM
/COM ==============================================================================
/COM =======================    MINIMUM VALUES OF S3    ============================
/COM
NSORT,S,3,1,0,2,SEL
PRNSOL,S,PRIN
NUSORT
/COM
/COM ==============================================================================
/COM ==============================================================================
/COM ==============================================================================
/COM ================================  SET 3  ======================================
/COM
SET,3
ESEL,TYPE,1
NELEM
/COM
/COM ==============================================================================
/COM =======================    MAXIMUM VALUES OF S1    ============================
/COM
NSORT,S,1,0,0,2,SEL
PRNSOL,S,PRIN
NUSORT
/COM
/COM ==============================================================================
/COM =======================    MINIMUM VALUES OF S3    ============================
/COM
NSORT,S,3,1,0,2,SEL
PRNSOL,S,PRIN
NUSORT
/COM
/COM ==============================================================================
/COM ==============================================================================
/COM ==============================================================================
/COM ================================  SET 4  ======================================
/COM
SET,4
ESEL,TYPE,1
NELEM
/COM
/COM ==============================================================================
/COM =======================    MAXIMUM VALUES OF S1    ============================
/COM
```

```
NSORT,S,1,0,0,2,SEL
PRNSOL,S,PRIN
NUSORT
/COM
/COM ==============================================================================
/COM =======================    MINIMUM VALUES OF S3    ============================
/COM
NSORT,S,3,1,0,2,SEL
PRNSOL,S,PRIN
NUSORT
/COM
/COM ==============================================================================
/COM ==============================================================================
/COM ==============================================================================
/COM ================================  SET 5  ====================================
/COM
SET,5
ESEL,TYPE,1
NELEM
/COM
/COM ==============================================================================
/COM =======================    MAXIMUM VALUES OF S1    ============================
/COM
NSORT,S,1,0,0,2,SEL
PRNSOL,S,PRIN
NUSORT
/COM
/COM ==============================================================================
/COM =======================    MINIMUM VALUES OF S3    ============================
/COM
NSORT,S,3,1,0,2,SEL
PRNSOL,S,PRIN
NUSORT
/COM
/COM ==============================================================================
/COM ==============================================================================
/COM ==============================================================================
/COM
EALL
NALL
FINI
/OUTPUT
/EXIT
```

Below is the ANSYS output file for pad max/min principal stresses for the soft rock analyses with adjusted LTSP loads:

```
     STRESS DATA SORTED AND PRINTED BY LOAD STEP


     THIS ROUTINE SORTS AND PRINTS PRINCIPAL STRESS DATA BY LOAD STEP
     FIRST S1 AND THEN S3

  SOFT ROCK RESULTS


 CURRENT JOBNAME REDEFINED AS dcslabs2a

 RESUME ANSYS DATA FROM FILE NAME=dcslabs2a.db

 *** ANSYS GLOBAL STATUS ***

 TITLE = Pad, ADJ LTSP(2), 20 Casks, 462 Kips West (X), Soft Rock
 ANALYSIS TYPE =  STATIC (STEADY-STATE)
 NUMBER OF ELEMENT TYPES =      6
   15348 ELEMENTS CURRENTLY SELECTED.  MAX ELEMENT NUMBER =    33177
   17051 NODES CURRENTLY SELECTED.     MAX NODE NUMBER =       17051
     259 KEYPOINTS CURRENTLY SELECTED. MAX KEYPOINT NUMBER =     259
     250 LINES CURRENTLY SELECTED.     MAX LINE NUMBER =         396
     181 AREAS CURRENTLY SELECTED.     MAX AREA NUMBER =         295
      70 VOLUMES CURRENTLY SELECTED.   MAX VOL. NUMBER =          70
     11 COMPONENTS CURRENTLY DEFINED
 MAXIMUM LINEAR PROPERTY NUMBER        =       5
 MAXIMUM REAL CONSTANT SET NUMBER      =       6
 ACTIVE COORDINATE SYSTEM              =       0  (CARTESIAN)
 MAXIMUM CONSTRAINT EQUATION NUMBER    =    4620
 NUMBER OF SPECIFIED CONSTRAINTS       =    2193
 NUMBER OF NODAL LOADS                 =    2160

 INITIAL JOBNAME = dcslabs2a
 CURRENT JOBNAME = dcslabs2a


 PRINT HEADER
 DO NOT PRINT SUBTITLE(S)
 DO NOT PRINT LOAD STEP ID
 DO NOT PRINT NOTE LINE(S)
 PRINT COLUMN HEADER LABELS
 DO NOT PRINT REPORT TOTALS
1

 ***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7     *****
 ANSYS/Structural U
 00150104          VERSION=INTEL NT      19:12:48  NOV 24, 2001 CP=      0.941

 Pad, ADJ LTSP(2), 20 Casks, 462 Kips West (X), Soft Rock
```

```
          ***** ANSYS RESULTS INTERPRETATION (POST1) *****

*** NOTE ***                            CP=      0.941   TIME= 19:12:48
Reading results into the database (SET command) will update the current
 displacement and force boundary conditions in the database with the
 values from the results file for that load set.  Note that any
 subsequent solutions will use these values unless action is taken to
 either SAVE the current values or not overwrite them (/EXIT,NOSAVE).

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

   17051  NODES (OF    17051  DEFINED) SELECTED BY NALL  COMMAND.

===============================================================================
===============================================================================
===============================================================================
================================  SET 1  ====================================


USE LOAD STEP     1  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     1  SUBSTEP=     1  CUMULATIVE ITERATION=    13
  TIME/FREQUENCY=  1.0000
TITLE= Pad, ADJ LTSP(2), 20 Casks, 462 Kips North (Z), Soft Rock

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      ALL NODES HAVING ANY ELEMENT IN ELEMENT SET.

   11550 NODES (OF    17051  DEFINED) SELECTED FROM
    9056 SELECTED ELEMENTS BY NELE COMMAND.

===============================================================================
=======================    MAXIMUM VALUES OF S1    ============================


SORT ON ITEM=S     COMPONENT=1     ORDER= 0  KABS= 0  NMAX=       2

SORT COMPLETED FOR       2 VALUES.

PRINT S    NODAL SOLUTION PER NODE
1

***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7     *****
ANSYS/Structural U
00150104          VERSION=INTEL NT      19:12:52  NOV 24, 2001 CP=      4.456

Pad, ADJ LTSP(2), 20 Casks, 462 Kips North (Z), Soft Rock
```

NODE	S1	S2	S3	SINT	SEQV
7439	334.57	-9.6187	-134.71	469.28	420.91
15443	334.57	-9.6187	-134.71	469.28	420.91

NODE SORT REMOVED

```
================================================================================
=======================    MINIMUM VALUES OF S3    ============================

SORT ON ITEM=S     COMPONENT=3     ORDER= 1  KABS= 0  NMAX=       2

SORT COMPLETED FOR       2 VALUES.

PRINT S    NODAL SOLUTION PER NODE
1

***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7     *****
ANSYS/Structural U
00150104          VERSION=INTEL NT      19:12:52  NOV 24, 2001 CP=      4.647

Pad, ADJ LTSP(2), 20 Casks, 462 Kips North (Z), Soft Rock
```

NODE	S1	S2	S3	SINT	SEQV
15363	12.966	-77.523	-618.76	631.73	591.70
7349	12.966	-77.522	-618.76	631.73	591.70

NODE SORT REMOVED

```
================================================================================
================================================================================
================================================================================
================================  SET 2  =====================================

USE LOAD STEP     2  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     2  SUBSTEP=     1  CUMULATIVE ITERATION=    22
  TIME/FREQUENCY=  2.0000
TITLE= Pad, ADJ LTSP(2), 20 Casks, 462 Kips N 32.93 W (Z,X), Soft Rock

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      ALL NODES HAVING ANY ELEMENT IN ELEMENT SET.

   11550 NODES (OF    17051  DEFINED) SELECTED FROM
    9056 SELECTED ELEMENTS BY NELE COMMAND.
```

```
==============================================================================
=======================    MAXIMUM VALUES OF S1    ============================

SORT ON ITEM=S     COMPONENT=1     ORDER= 0  KABS= 0  NMAX=       2

SORT COMPLETED FOR       2 VALUES.

PRINT S    NODAL SOLUTION PER NODE
1

***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7     *****
ANSYS/Structural U
00150104          VERSION=INTEL NT      19:12:56  NOV 24, 2001 CP=      8.152

Pad, ADJ LTSP(2), 20 Casks, 462 Kips N 32.93 W (Z,X), Soft Rock


   NODE    S1          S2          S3          SINT        SEQV
  15443   352.27      32.471     -129.92      482.19      424.94
  15447   292.07      66.034     -60.358      352.42      309.25

NODE SORT REMOVED

==============================================================================
=======================    MINIMUM VALUES OF S3    ============================

SORT ON ITEM=S     COMPONENT=3     ORDER= 1  KABS= 0  NMAX=       2

SORT COMPLETED FOR       2 VALUES.

PRINT S    NODAL SOLUTION PER NODE
1

***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7     *****
ANSYS/Structural U
00150104          VERSION=INTEL NT      19:12:57  NOV 24, 2001 CP=      8.332

Pad, ADJ LTSP(2), 20 Casks, 462 Kips N 32.93 W (Z,X), Soft Rock


   NODE    S1          S2          S3          SINT        SEQV
   7349  -80.557     -128.79     -771.44      690.89      668.08
   7350   173.40     -119.94     -425.10      598.51      518.35

NODE SORT REMOVED

==============================================================================
==============================================================================
==============================================================================
================================  SET 3  =====================================
```

```
USE LOAD STEP     3  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     3  SUBSTEP=     1  CUMULATIVE ITERATION=    26
  TIME/FREQUENCY=  3.0000
TITLE= Pad, ADJ LTSP(2), 20 Casks, 462 Kips N 45 W (Z,X), Soft Rock

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      ALL NODES HAVING ANY ELEMENT IN ELEMENT SET.

   11550 NODES (OF    17051  DEFINED) SELECTED FROM
    9056 SELECTED ELEMENTS BY NELE COMMAND.

==============================================================================
=======================    MAXIMUM VALUES OF S1    ============================


SORT ON ITEM=S     COMPONENT=1     ORDER= 0  KABS= 0  NMAX=       2

SORT COMPLETED FOR       2 VALUES.

PRINT S    NODAL SOLUTION PER NODE
1

***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7     *****
ANSYS/Structural U
00150104          VERSION=INTEL NT      19:13:00  NOV 24, 2001 CP=     11.847

Pad, ADJ LTSP(2), 20 Casks, 462 Kips N 45 W (Z,X), Soft Rock


 NODE     S1          S2          S3          SINT        SEQV
 15443   348.71      41.476     -127.39      476.10      418.08
 15447   287.16      78.852     -54.541      341.70      298.28

NODE SORT REMOVED

==============================================================================
=======================    MINIMUM VALUES OF S3    ============================


SORT ON ITEM=S     COMPONENT=3     ORDER= 1  KABS= 0  NMAX=       2

SORT COMPLETED FOR       2 VALUES.

PRINT S    NODAL SOLUTION PER NODE
1
```

```
***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7     *****
ANSYS/Structural U
00150104          VERSION=INTEL NT      19:13:01  NOV 24, 2001 CP=     12.027

Pad, ADJ LTSP(2), 20 Casks, 462 Kips N 45 W (Z,X), Soft Rock


   NODE     S1          S2          S3          SINT        SEQV
   7349   -92.523     -137.82     -776.14      683.61      662.13
   7350    153.19     -143.33     -421.18      574.37      497.50

NODE SORT REMOVED

===============================================================================
===============================================================================
===============================================================================
=================================  SET 4  ====================================


USE LOAD STEP     4  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     4  SUBSTEP=     1  CUMULATIVE ITERATION=    31
  TIME/FREQUENCY=  4.0000
TITLE= Pad, ADJ LTSP(2), 20 Casks, 462 Kips N 57.07 W (Z,X), Soft Rock

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      ALL NODES HAVING ANY ELEMENT IN ELEMENT SET.

   11550 NODES (OF    17051  DEFINED) SELECTED FROM
    9056 SELECTED ELEMENTS BY NELE COMMAND.

===============================================================================
=======================    MAXIMUM VALUES OF S1    ============================


SORT ON ITEM=S     COMPONENT=1     ORDER= 0  KABS= 0  NMAX=       2

SORT COMPLETED FOR       2 VALUES.

PRINT S    NODAL SOLUTION PER NODE
1

***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7     *****
ANSYS/Structural U
00150104          VERSION=INTEL NT      19:13:05  NOV 24, 2001 CP=     15.532

Pad, ADJ LTSP(2), 20 Casks, 462 Kips N 57.07 W (Z,X), Soft Rock
```

NODE	S1	S2	S3	SINT	SEQV
15443	341.03	44.030	-122.43	463.46	406.64
15447	280.41	83.890	-48.461	328.87	286.61

NODE SORT REMOVED

==========
========== MINIMUM VALUES OF S3 ==========

SORT ON ITEM=S COMPONENT=3 ORDER= 1 KABS= 0 NMAX= 2

SORT COMPLETED FOR 2 VALUES.

PRINT S NODAL SOLUTION PER NODE
1

***** ANSYS - ENGINEERING ANALYSIS SYSTEM RELEASE 5.7 *****
ANSYS/Structural U
00150104 VERSION=INTEL NT 19:13:05 NOV 24, 2001 CP= 15.723

Pad, ADJ LTSP(2), 20 Casks, 462 Kips N 57.07 W (Z,X), Soft Rock

NODE	S1	S2	S3	SINT	SEQV
7349	-91.142	-137.35	-748.40	657.26	635.41
4891	3.0645	-139.89	-435.70	438.77	387.59

NODE SORT REMOVED

==========
==========
==========
========== SET 5 ==========

USE LOAD STEP 5 SUBSTEP 0 FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP= 5 SUBSTEP= 1 CUMULATIVE ITERATION= 39
TIME/FREQUENCY= 5.0000
TITLE= Pad, ADJ LTSP(2), 20 Casks, 462 Kips West (X), Soft Rock

ESEL FOR LABEL= TYPE FROM 1 TO 1 BY 1

9056 ELEMENTS (OF 15348 DEFINED) SELECTED BY ESEL COMMAND.

SELECT ALL NODES HAVING ANY ELEMENT IN ELEMENT SET.

11550 NODES (OF 17051 DEFINED) SELECTED FROM
9056 SELECTED ELEMENTS BY NELE COMMAND.

==========

```
=======================    MAXIMUM VALUES OF S1    ============================

SORT ON ITEM=S     COMPONENT=1     ORDER= 0  KABS= 0  NMAX=       2

SORT COMPLETED FOR       2 VALUES.

PRINT S    NODAL SOLUTION PER NODE
1

***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7     *****
ANSYS/Structural U
00150104          VERSION=INTEL NT      19:13:09  NOV 24, 2001 CP=     19.228

Pad, ADJ LTSP(2), 20 Casks, 462 Kips West (X), Soft Rock


   NODE    S1          S2          S3          SINT        SEQV
  15363   308.89      4.0363     -98.291      407.18      366.88
  15443   308.84      4.0056     -98.276      407.12      366.83

NODE SORT REMOVED

===============================================================================
=======================    MINIMUM VALUES OF S3    ============================

SORT ON ITEM=S     COMPONENT=3     ORDER= 1  KABS= 0  NMAX=       2

SORT COMPLETED FOR       2 VALUES.

PRINT S    NODAL SOLUTION PER NODE
1

***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7     *****
ANSYS/Structural U
00150104          VERSION=INTEL NT      19:13:09  NOV 24, 2001 CP=     19.418

Pad, ADJ LTSP(2), 20 Casks, 462 Kips West (X), Soft Rock


   NODE    S1          S2          S3          SINT        SEQV
   7439  -51.762     -69.195     -573.74      521.97      513.48
   7349  -51.767     -69.190     -573.72      521.95      513.46

NODE SORT REMOVED

===============================================================================
===============================================================================
===============================================================================


   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.
```

```
   17051  NODES (OF    17051  DEFINED) SELECTED BY NALL  COMMAND.

EXIT THE ANSYS POST1 DATABASE PROCESSOR

***** ROUTINE COMPLETED *****  CP =        19.548
```

Originator: S. C. Tumminelli
Date: May 25, 2001
Reissued: November 30, 2001

Appendix MD-1

Cask Centerline Nodes

This Appendix presents a confirmation that the nodes selected to be at the centerlines of the perimeter casks are, indeed, at the centerlines.

The nodes at the centerlines of the casks were selected using the ANSYS graphics commands. First, all the nodes at the surface of the pad were selected. Then the nodes at the cask centerlines were simply "picked". Actually, the model has no nodes exactly at the cask centerlines. The nodes that were picked were those closest to the pad corners (edges) where the higher pad vertical displacements were expected. The nodes were selected from the two that straddle the centerline, and they are 7 inches from it, see Figure 6 in the calculation PGE-009-CALC-003. The list of selected nodes, together with their coordinates, is provided below, (output file generated by ANSYS.)

```
LIST ALL SELECTED NODES.   DSYS=  0

***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7     *****
ANSYS/Structural U
00150104          VERSION=INTEL NT      12:33:02  APR 12, 2001 CP=      8.082

Pad, LTSP(4), 20 Casks, 156 Kips West (X), Max Up, Soft Rock
```

NODE	X	Y	Z	THXY	THYZ	THZX
159	408.00	-0.42861E-15	7.0000	0.00	0.00	0.00
3022	408.00	0.42861E-15	-823.00	0.00	0.00	0.00
3735	612.00	-0.42861E-15	7.0000	0.00	0.00	0.00
4467	612.00	-0.42861E-15	-197.00	0.00	0.00	0.00
5178	612.00	0.42861E-15	-415.00	0.00	0.00	0.00
5890	612.00	0.42861E-15	-619.00	0.00	0.00	0.00
6602	612.00	0.42861E-15	-823.00	0.00	0.00	0.00
8183	204.00	-0.42861E-15	7.0000	0.00	0.00	0.00
11046	204.00	0.42861E-15	-823.00	0.00	0.00	0.00
11759	0.0000	-0.42861E-15	7.0000	0.00	0.00	0.00
12491	0.0000	-0.42861E-15	-197.00	0.00	0.00	0.00
13202	0.0000	0.42861E-15	-415.00	0.00	0.00	0.00
13914	0.0000	0.42861E-15	-619.00	0.00	0.00	0.00
14626	0.0000	0.42861E-15	-823.00	0.00	0.00	0.00

One way to assure that the list is correct is to make use of a unique feature in ANSYS, the ENODE and NELEM commands. ANSYS does not process the nodes that are associated with elements automatically. Rather it processes "selected" sets of these entities and handles them separately. Now, ENODE is a command that says, "Make the element set consist of only those elements that are associated with the set of selected nodes." And NELEM is a command that says, "Make the node set consist of only those nodes that are associated with the set of selected elements." So, if a selected set of nodes is the starting point, then an execution of ENODE would provide only those elements that are associated with the selected set. A few iterations of executing the commands NELEM and then ENODE followed by an element plot, results in series of plots which depict the model as appearing to "grow" from the "seeds" representing the original selected node set. If the growth shows that the model develops into the casks from the centerline symmetrically, then the "seeds' must have been at the centerlines of the casks.

The plots below, Figures 1 to 5, were created by executing the commands as follows:

Figure 1 - Initial set of nodes, i.e., the nodes selected to be at the centerlines of the casks. ENODE creates the element set containing only those elements that have a node associated with the selected set of nodes. EPLO that creates an element plot.

Figure 2 - NELEM creates a new set of selected nodes, namely all nodes that are associated with the existing element set. ENODE expands the selected element set, followed by an element plot.

Figures 3 to 5, same as for Figure 2.

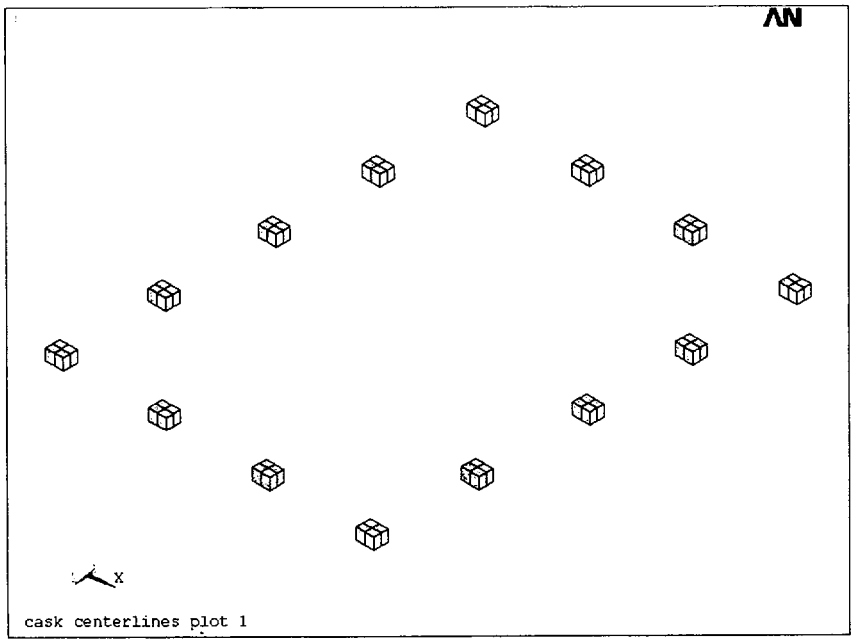


Figure 1 - Initial node set and first execution of ENODE

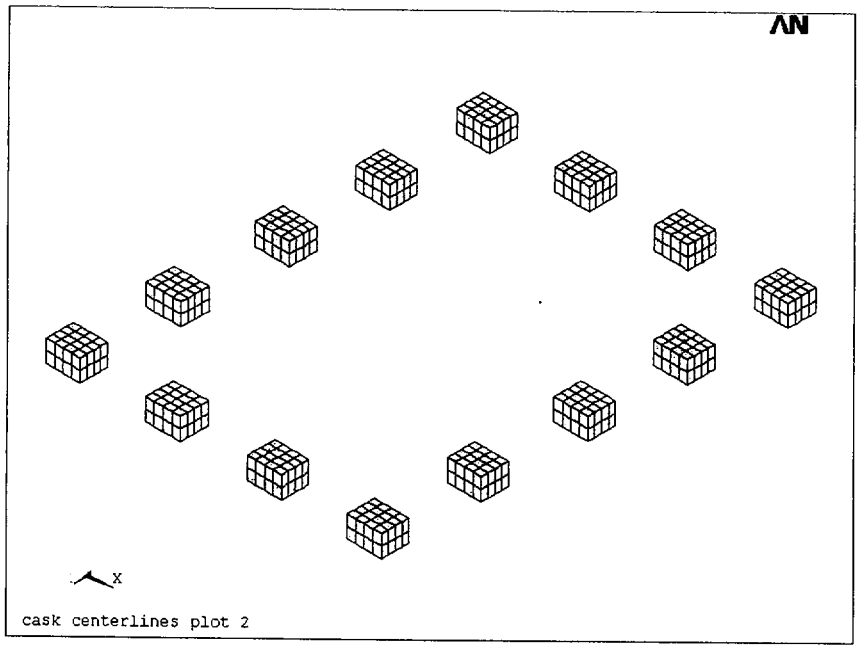


Figure 2 - Execution of NELEM followed by ENODE

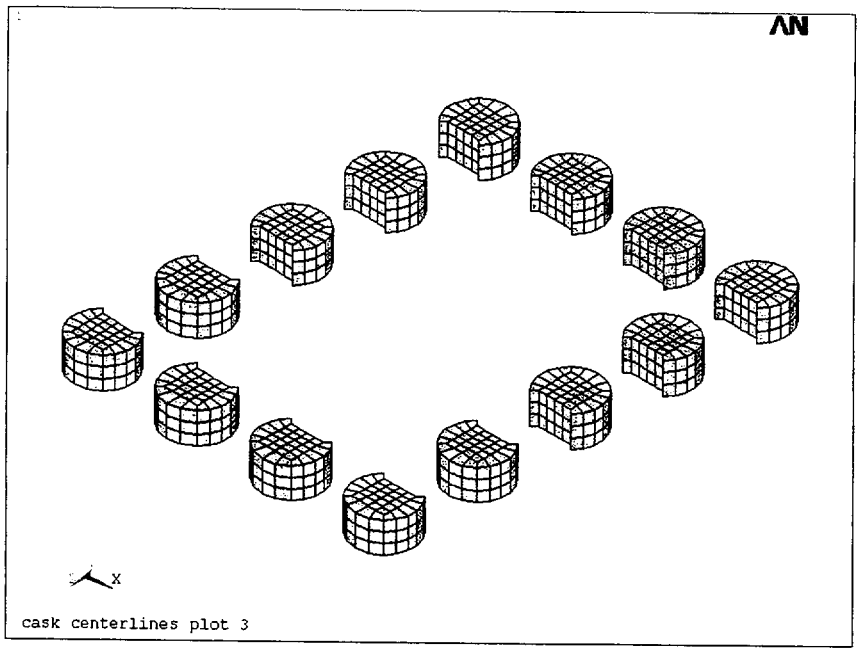


Figure 3- Execution of NELEM followed by ENODE

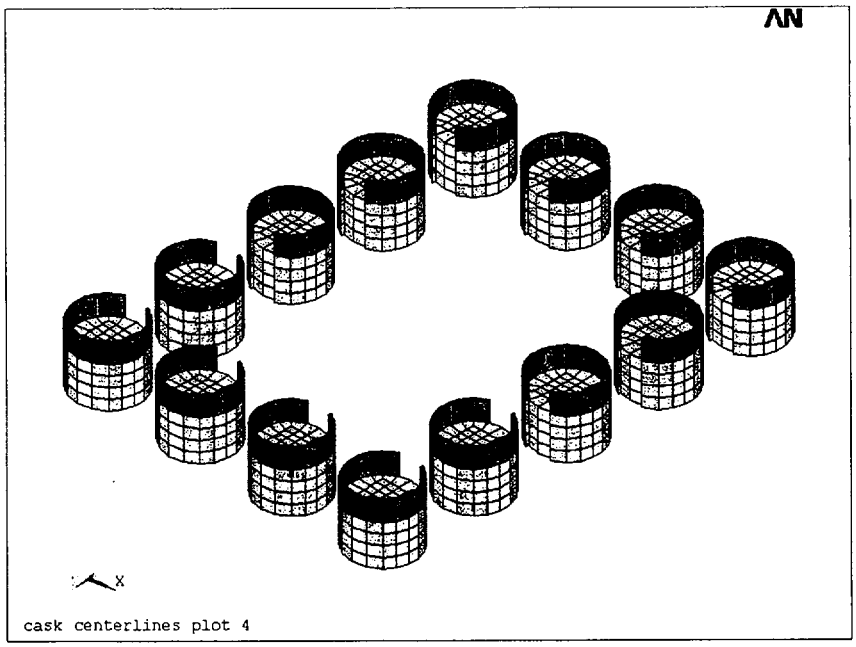


Figure 4- Execution of NELEM followed by ENODE

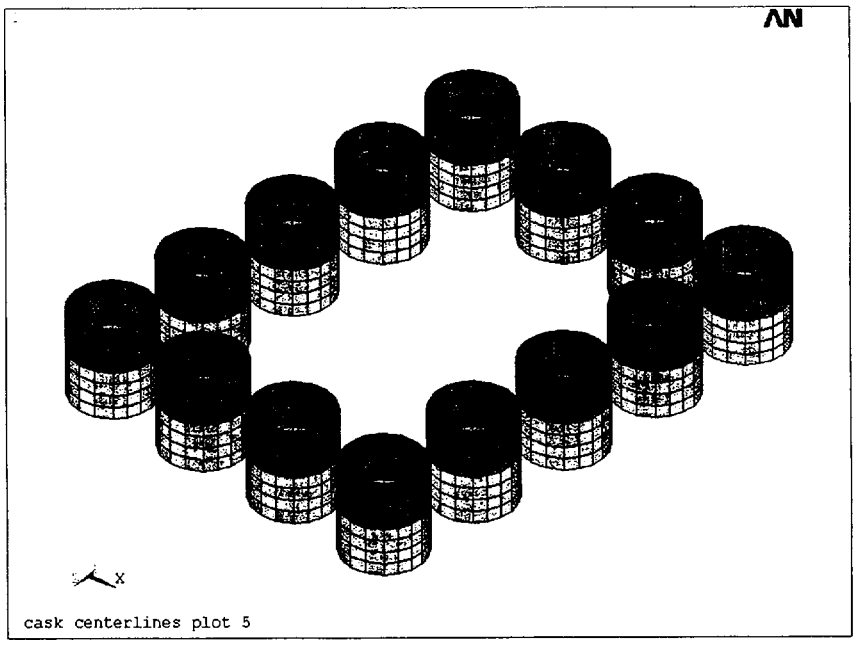


Figure 5- Execution of NELEM followed by ENODE

This last plot, Figure 5, results in full round sections beneath the casks, and a portion of each cask above the pad. And, the "growth" of this model was from within the cask circle. Hence, the initial nodes selected were at (or very close to) the centerlines of the casks.

Originator: S. C. Tumminelli
Date: May 25, 2001
Revised: November 30, 2001

Appendix MD-2

Cask/Embedment Structure Frequency

This Appendix presents a calculation for the approximate frequency of the cask/embedment structure frequency. Then a calculation of Young's Modulus for use in the modeling of the casks on the pad is presented. Reference numbers are for the references in the main calculation.

Revision reflects changes in rod length made in the –001 calculation.

This calculation is to compute the frequency of the cask/embedment structure frequency. A simplified model of the system is shown in Figure 1 below. The cask is assumed to be rigid with the full mass concentrated at the Center of Gravity of the cask, which is located 118.5 inches from the baseplate. The baseplate is assumed to be rigid. The flexibility of the round anchor bars is the only contributor to the frequency of the system.

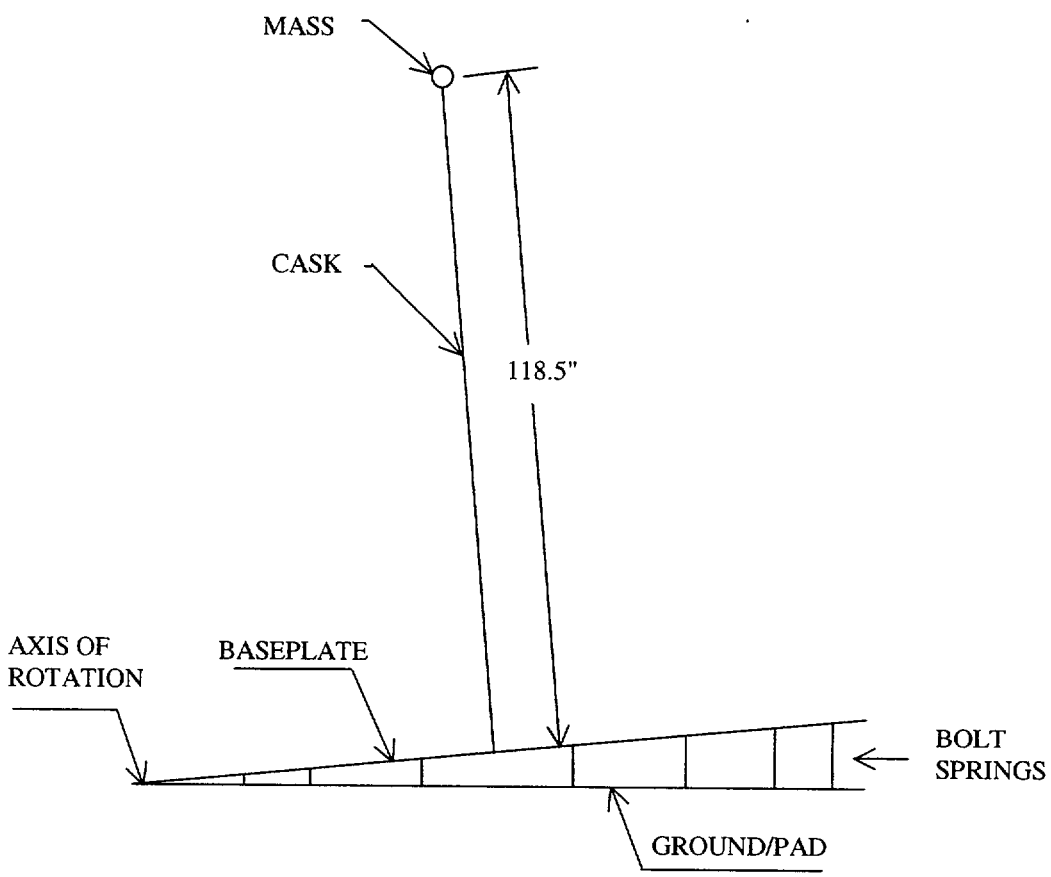


Figure 1

The bolt springs are 2 ½ inch diameter bars in series with the 5 ½ inch coupler. The stiffness of the two components in series is: $k_S = 1.932 \times 10^6$ lb/in (Ref. 6). The stiffness of each bolt spring translated to a horizontal stiffness at the mass is:

$$k_M = \frac{k_S}{\left(\frac{h}{x}\right)^2} = k_S\left(\frac{x}{h}\right)^2$$

where h is the height of the mass, i.e., 118.5 inches and x is the distance of the spring from the neutral axis.

And, the system frequency is:

$$f = \frac{1}{2\pi}\sqrt{\frac{\Sigma k_M}{M}}$$

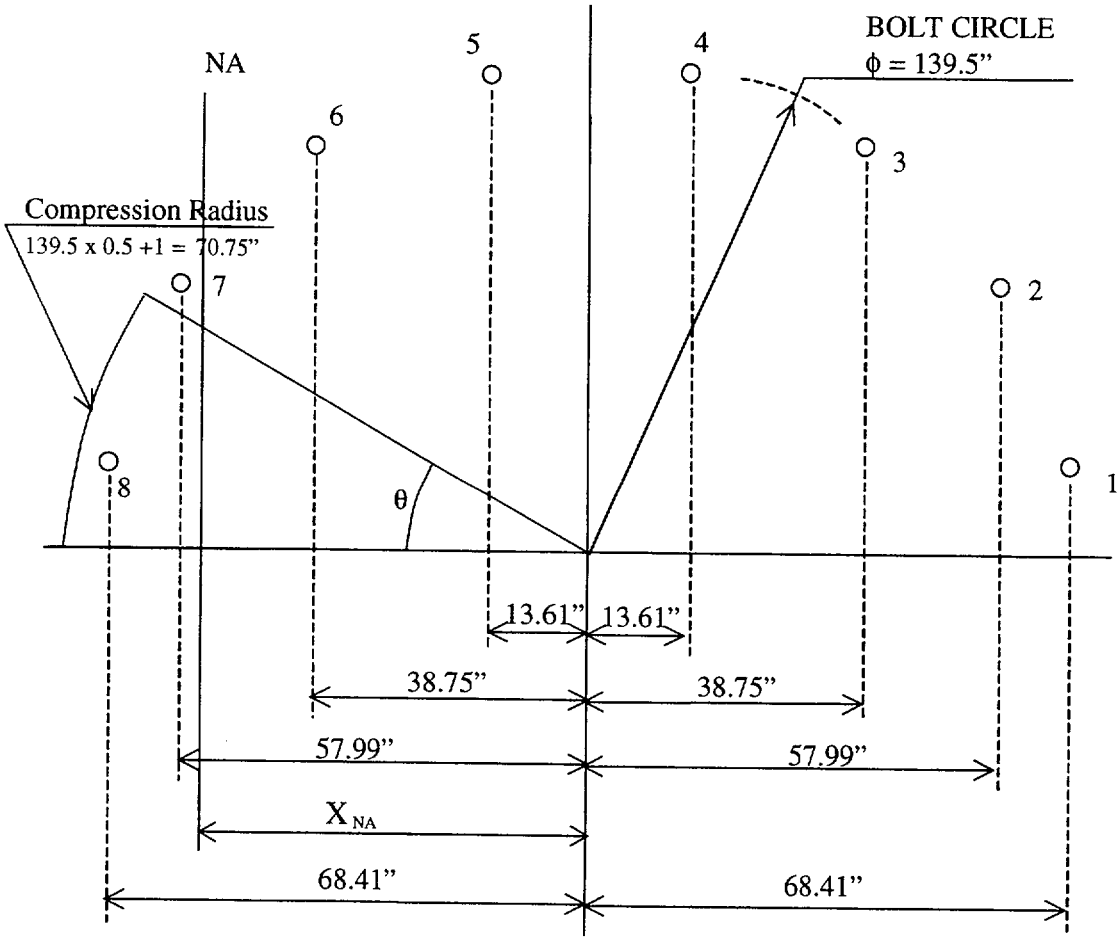
$$\Sigma k_M = k_S\,\Sigma\left(\frac{x}{h}\right)^2 = k_S\,\frac{\Sigma x^2}{h^2}$$

where the summation is over the x's, i.e., the distances from the neutral axis to the bolt.

Therefore:

$$f = \frac{1}{2\pi}\sqrt{\frac{k_S\,\Sigma x^2}{h^2\,M}} = \frac{1}{2h\pi}\sqrt{\frac{k_S\,\Sigma x^2}{M}} = \frac{1}{2h\pi}\sqrt{\frac{k_S\,\Sigma x^2\,g}{W}}$$

Now locate the neutral axis of the anchor stud configuration:



Plan Geometry of the Cask Anchor Studs

Locate the neutral axis (X_{NA}) by setting the bar tension and concrete compression forces equal. Several iterations have been performed, which resulted in the Neutral Axis location as demonstrated below:

$X_{NA} = 57.94$ in

Thus, $\theta = 35.02^{\circ} = 0.6112$ Radians

Twelve (2 x 6) bars are in tension:

Tension force in the bars:

$P_{y,\,min} = 176.7$ kips
$P_{y,\,max} = 235.6$ kips

Use the average of these values for calculation: Say, $P_{y,\,expected} = 206.2$ kips

Net tension force: T = 2 x 6 x 206.2 = 2474.4 kip

Concrete compression force:

Since the bars are at a yield stress, use a "working stress" value for the concrete: Thus use 5.95/1.7 = 3.5 ksi for the bearing stress:

Net compression force:

$$C = 3.5R^2\left(\theta - \frac{1}{2}\sin 2\theta\right) =$$

$$= 3.5x70.75^2\left(0.6112 - \frac{1}{2}\sin(2x35.02)\right) = 2474.4 \text{ kip}, \quad \text{versus 2474.4 kip, OK}$$

Computing the summation of the x^2

BOLT	x	x^2
1	57.94 + 68.41 = 126.35	15964
2	57.94 + 57.99 = 115.93	13440
3	57.94 + 38.75 = 96.69	9349
4	57.94 + 13.91 = 71.85	5162
5	57.94 - 13.91 = 44.03	1939
6	57.94 - 38.75 = 19.19	368
		$\Sigma = 46222$

Now;

$$f = \frac{1}{(2)(118.5)\pi}\sqrt{\frac{2(1.932x10^6)(46222)(386.4)}{360000}} = 18.6\,\text{Hz}$$, accounting for 2 bolts at each x.

Moving the X_{NA} to the right say 10 inches to the right and re-computing the summation of the x^2, and re-computing the frequency.

BOLT	x	x^2
1	47.94 + 68.41 = 116.35	13537
2	47.94 + 57.99 = 105.93	11221
3	47.94 + 38.75 = 86.69	7515
4	47.94 + 13.91 = 61.85	3825
5	47.94 - 13.91 = 34.03	1158
6	47.94 - 38.75 = 9.19	84
		$\Sigma = 37340$

Now;

$$f = \frac{1}{(2)(118.5)\pi}\sqrt{\frac{2(1.932x10^6)(37340)(386.4)}{360000}} = 16.7\,\text{Hz}$$, accounting for 2 bolts at each x

An approximate frequency in the range of 16 to 18 Hz for the system is reasonable.

Now, using 16 Hz as a target frequency, compute the Young's Modulus required for a circular cross section, 139.5 inches in diameter, with a 12 inch wall. It stands 118.5 inches high, cantilevered from the surface of the pad, with a concentrated weight of 360,000 pounds at the top.

$$k = \frac{3EI}{L^3}$$

and $$f = \frac{1}{2\pi}\sqrt{\frac{k}{M}} = \frac{1}{2\pi}\sqrt{\frac{3EIg}{L^3W}}$$

$$\therefore\ 2f\pi = \sqrt{\frac{3EIg}{L^3W}}$$

$$\therefore\ (2f\pi)^2 = \frac{3EIg}{L^3W}$$

$$\therefore \quad (2f\pi)^2 L^3 W = 3EIg$$

$$\therefore \quad E = \frac{(2f\pi)^2 L^3 W}{3Ig}$$

Now,

$$I = \frac{\pi t d^3}{8} = \frac{\pi(12)(139.5)^3}{8} = 12.792 \times 10^6 \text{ inches}^4$$

And,

$$E = \frac{(2\pi(16))^2 (118.5)^3\, 360000}{(3)(12.792 \times 10^6)(386.4)} = 408000 \text{ psi}$$

A Young's Modulus of 409000 psi was used in the analysis. Taking this value and computing the inertia with a little more accuracy:

$$I = \frac{\pi}{64}\left(d_o^4 - d_i^4\right) = \frac{\pi}{64}\left((139.5+12)^4 - (139.5-12)^4\right) = 12.887 \times 10^6 \text{ inches}^4$$

$$f = \frac{1}{2\pi}\sqrt{\frac{(3)(409000)(12.887 \times 10^6)(386.4)}{(118.5)^3(360000)}} = 16.07 \text{ Hz} \quad \therefore \text{Ok}$$

Originator: S. C. Tumminelli
Date: May 25, 2001
Revised: November 30, 2001

Appendix MD-3

Boundary Condition Study

This Appendix presents a calculation that examines the affect of the boundary conditions on the rock mass. It concludes that the boundary conditions used in the calculation lead to acceptably accurate results.

The purpose of this calculation is to assess the effect of the boundary conditions on the rock mass on the computed responses. Or, put another way, to determine if the rock mass is large enough and its boundaries far enough away from the pad, that the boundary conditions do not significantly affect the results. In order to assess the affect of boundary conditions the vertical displacement constraint on the sides of the rock mass was released, and the analyses were rerun. The new boundary conditions are referred to here as U,x,z representing that only the x and z displacements at the edges of the rock mass are constrained. In order to maintain equilibrium, all three displacements are constrained at the bottom of the rock mass. Figures MD-3-1, -2 and –3 are the same views as shown in Figures 16, 17 and 18 of the calculation. These show that the Uy is not constrained. The analyses with all three displacements constrained, are referred to as U,x,y,z. These are the results computed in the calculation. If the boundary conditions really effect the computed responses than the differences should be detected in the data analyses that follow.

All differences were assessed using ratios of the U,x,z response ÷ the U,x,y,z response. These are shown in Tables MD-3.1 through MD-3.7. All responses computed were assessed. Thus, Tables MD-3.1 and MD-3.4 assess maximum pad displacement response and pad displacement response beneath the perimeter casks for the soft and hard rock models. Tables MD-3.2, 3.3, 3.5 and 3.6 assess pad stress response for the soft and hard rock models. Table MD-3.7 assesses the rock stress response for both the hard and soft rock models. All relative response ratios are computed to two decimal places.

A criterion of ± 10% was selected as an acceptable assessment ratio, though the two analyses are generally much closer than this. This level is considered to be within the tolerance of engineering accuracy given the variability of the magnitude of the loads, the accuracy of the concrete Young's Modulus, and especially the fact that this is static simulation of a dynamic response.

Examining these Tables reveals the following:

- The hard rock analyses correlate more closely than the soft rock analyses.
- The displacements for the U,x,z analyses are generally higher than those from U,x,y,z.
- There are three outliers in Table MD-3.1 for the cask displacement comparisons. These three outliers are all formed from exceedingly small displacements, probably on the order of the convergence tolerance. This, together with the fact that the stresses are very well behaved, leads to the conclusion that these are analytical anomalies and not real responses to be concerned about.
- The pad stress results have no bias toward either the U,x,z or the U,x,y,z.
- The rock vertical stresses are very close and well behaved.

In order to better organize this data, Table MD – 3.0 was created from the data in Tables MD-3.1 through MD – 3.7. This Table shows all the response quantities and the number of response quantities within ±10%, ±5% and ±1%. These are the values in the numerator. The denominator is the total number of responses.

In summary, this study demonstrates that the boundary conditions at the rock boundary do not have a significant affect on the response quantities computed, and that the boundary conditions used in the analyses lead to reasonably accurate results.

An examination of the differences for the very hard rock model is not necessary since the hard rock model correlates very well, and the trend is that the stiffer the rock, the better the correlation.

The detailed data for the Tables is provided in other Appendices as follows, (see also Appendix RL-2 for the details of the force equilibrium comparisons):

- Table MD-3.1 see Appendices DN-3 and DN-4
- Tables MD-3.2 and 3.2 see Appendix SN-4
- Table MD-3.4 see Appendices DN-3 and DN-4
- Tables MD-3.5 and 3.6 see Appendix SN-4
- Table MD-3.7 see Appendix SN-5

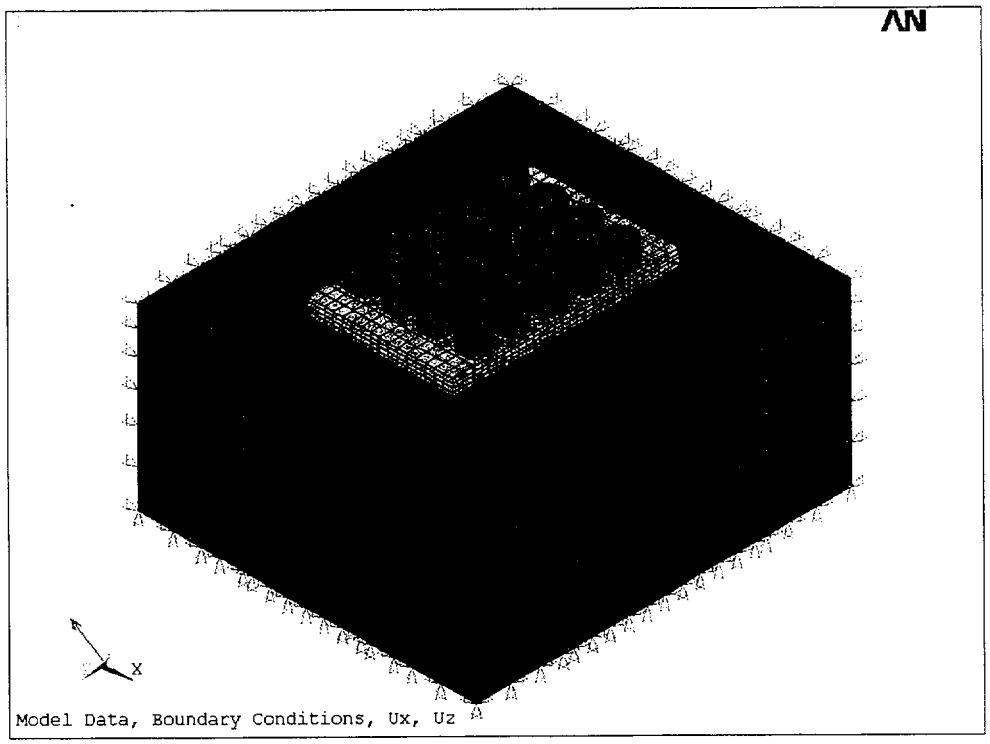


Figure MD - 3 - 1 Isometric of Boundary Conditions on the Rock Mass

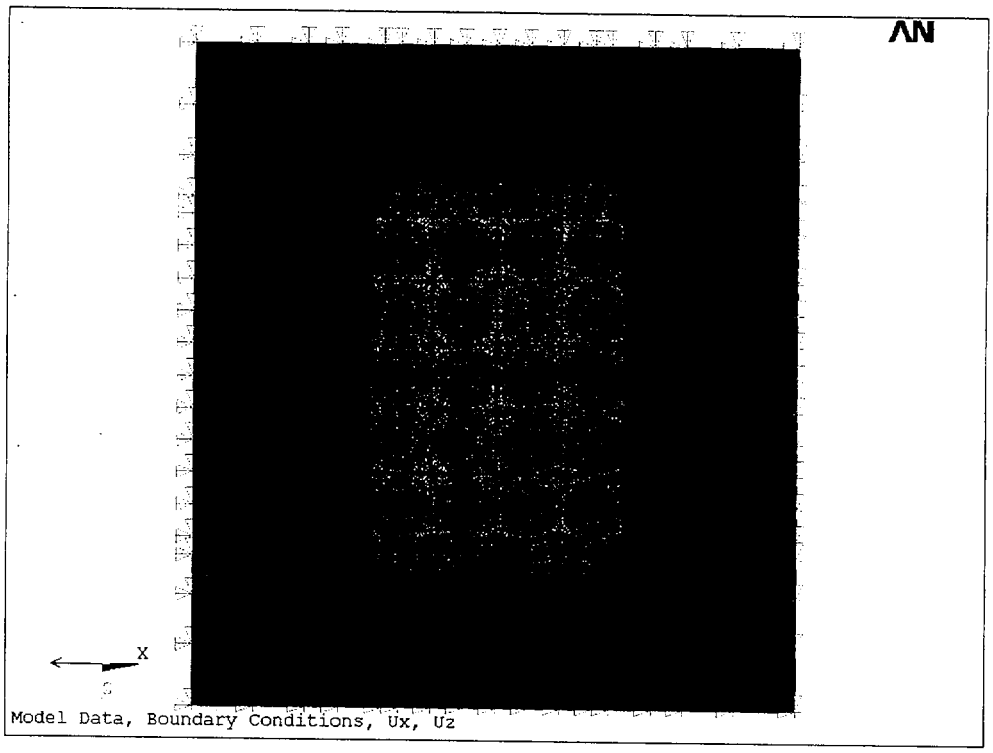


Figure MD - 3 - 2 Boundary Conditions on the Rock Mass Looking Down

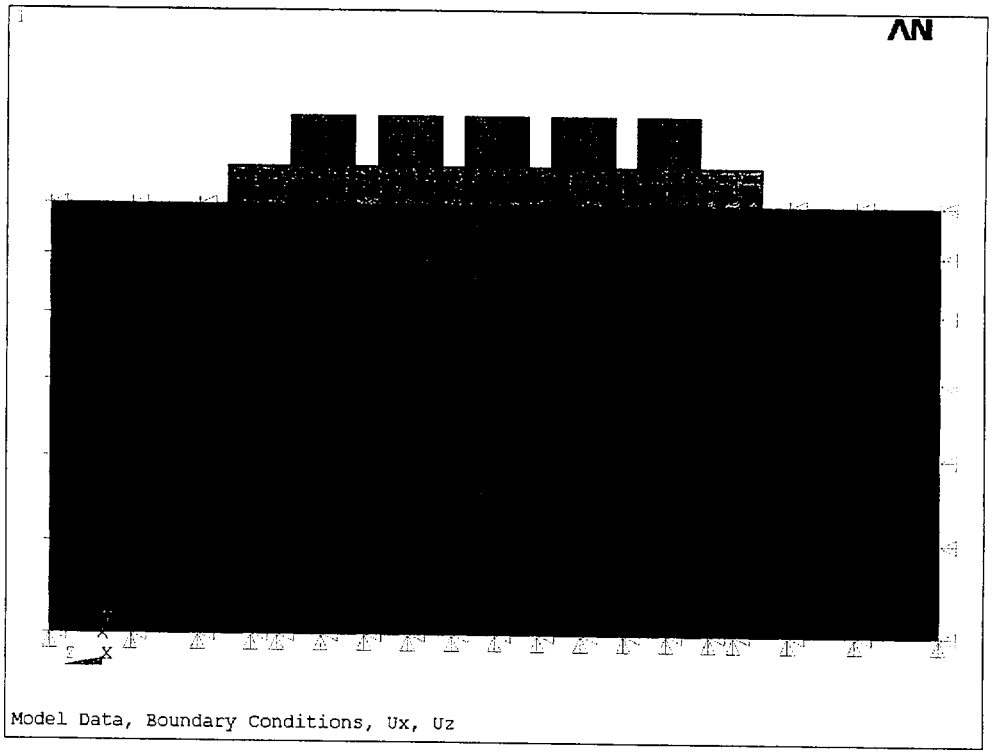


Figure MD – 3 – 3 Boundary Conditions on the Rock Mass Looking from the Side

Table MD - 3.0 – Quantification of Analysis Responses

Response Quantity	Number of responses within ± 10%		Number of responses within ± 5%		Number of responses within ± 1%	
	Soft Rock	Hard Rock	Soft Rock	Hard Rock	Soft Rock	Hard Rock
δ_{pad}	19/19	19/19	16/19	16/19	0/19	4/19
δ_{cask}	15#/19	19/19	5/19	18/19	0/19	1/19
$\sigma_{x\ pad}$	38/38	38/38	36/38	38/38	12/38	33/38
$\sigma_{z\ pad}$	38/38	38/38	32/38	38/38	5/38	27/38
$\sigma_{y\ rock}$	19/19	19/19	19/19	19/19	8/19	14/19

One ratio is 11%, and 3 ratios are formed from using exceedingly small numbers, on the order of 0.001 inch.

Table MD-3.1 - PAD RESPONSES - SOFT ROCK RESULTS - δ

LS	EQ	Direction	δ_{Max} U,x,y,z	δ_{Max} U,x,z	Ratio x,z/x,y,z	δ_{Cask} U,x,y,z	δ_{Cask} U,x,z	Ratio# x,z/x,y,z
1	[illegible]	Gravity	-0.0102	-0.0110	1.08	-0.0259**	-0.0265++	1.02
2	HE(1)	N	0.0584	0.0598	1.02	0.000451	0.00117	2.59
3	HE(1)	N32.93W	0.0986	0.1012	1.03	0.0223	0.0239	1.07
4	HE(1)	N45W	0.1006	0.1034	1.03	0.0271	0.0288	1.06
5	HE(1)	N57.07W	0.0939	0.0968	1.03	0.0282	0.0299	1.06
6	HE(1)	W	0.0467	0.0479	1.03	0.0133	0.0141	1.06
7	HE(1)*	N	0.0100	0.0105	1.05	-0.00736	-0.00713	0.97
8	HE(1)*	W	0.00903	0.00935	1.04	-0.00352	-0.00332	0.94
9	HE(3)*	N	-0.0138	-0.0143	1.04	-0.0452	-0.0457	1.01
10	HE(3)*	W	-0.0137	-0.0146	1.07	-0.0438	-0.0445	1.02
11	L(2)	N	0.0488	0.0500	1.02	-0.00237	-0.00174	0.73
12	L(2)	N32.93W	0.0818	0.0841	1.03	0.0149	0.0162	1.09
13	L(2)	N45W	0.0832	0.0857	1.03	0.0186	0.0201	1.08
14	L(2)	N57.07W	0.0772	0.0796	1.03	0.0192	0.0207	1.08
15	L(2)	W	0.0387	0.0397	1.03	0.00824	0.00892	1.08
16	L(2)*	N	0.0223	0.0228	1.02	-.000528	-.000242	0.46
17	L(2)*	W	0.0176	0.0181	1.03	0.00401	0.00432	1.08
18	L(4)*	N	0.0255	0.0260	1.02	0.00271	0.00301	1.11
19	L(4)*	W	0.0230	0.0235	1.02	0.00989	0.0103	1.04

\# One ratio is 11%, and 3 ratios are formed from using exceedingly small numbers, on the order of 0.001 inch.

* Load components marked with a * are combined using the 40-100-40 rule. All others are combined using the 100-40-40 rule.

** Values range from -0.0259 to -0.0342 (Perimeter casks only)

++ Values range from -0.0265 to -0.0345 (Perimeter casks only)

Table MD-3.2 - PAD RESPONSES - SOFT ROCK RESULTS - σ_X

LS	EQ	Direction	$\sigma_{X\ Max}$ U,x,y,z	$\sigma_{X\ Max}$ U,x,z	Ratio x,z/x,y,z	$\sigma_{X\ Min}$ U,x,y,z	$\sigma_{X\ Min}$ U,x,z	Ratio x,z/x,y,z
1		Gravity	32.9	33.1	1.01	-63.0	-59.7	0.95
2	HE(1)	N	45.6	44.4	0.97	-106.7	-106.4	1.00
3	HE(1)	N32.93W	144.4	145.3	1.01	-271.1	-268.9	0.99
4	HE(1)	N45W	192.1	192.3	1.00	-321.5	-318.6	0.99
5	HE(1)	N57.07W	233.9	233.7	1.00	-359.5	-356.1	0.99
6	HE(1)	W	260.7	260.2	1.00	-404.7	-392.4	0.97
7	HE(1)*	N	19.5	19.0	0.97	-44.3	-44.0	0.99
8	HE(1)*	W	120.6	120.6	1.00	-179.6	-174.0	0.97
9	HE(3)*	N	61.9	62.3	1.01	-117.3	-114.1	0.97
10	HE(3)*	W	82.5	84.2	1.02	-248.4	-235.8	0.95
11	L(2)	N	43.6	42.5	0.97	-93.9	-93.6	1.00
12	L(2)	N32.93W	136.7	137.2	1.00	-254.7	-252.6	0.99
13	L(2)	N45W	183.3	183.5	1.00	-302.3	-299.6	0.99
14	L(2)	N57.07W	223.2	223.0	1.00	-338.0	-334.9	0.99
15	L(2)	W	253.7	252.9	1.00	-378.8	-367.4	0.97
16	L(2)*	N	20.1	19.6	0.98	-39.1	-38.9	0.99
17	L(2)*	W	117.4	116.9	1.00	-169.5	-164.6	0.97
18	L(4)*	N	19.1	18.6	0.97	-33.7	-33.6	1.00
19	L(4)*	W	108.4	107.8	0.99	-159.4	-157.1	0.99

* Load components marked with a * are combined using the 40-100-40 rule. All others are combined using the 100-40-40 rule.

Table MD-3.3 - PAD RESPONSE - SOFT ROCK RESULTS - σ_Z

LS	EQ	Direction	$\sigma_{Z\ Max}$ U,x,y,z	$\sigma_{Z\ Max}$ U,x,z	Ratio x,z/x,y,z	$\sigma_{Z\ Min}$ U,x,y,z	$\sigma_{Z\ Min}$ U,x,z	Ratio x,z/x,y,z
1		Gravity	23.5	23.7	1.01	-55.2	-53.7	0.97
2	HE(1)	N	270.0	269.4	1.00	-404.1	-394.9	0.98
3	HE(1)	N32.93W	234.9	233.4	0.99	-409.6	-399.1	0.97
4	HE(1)	N45W	208.7	206.8	0.99	-378.8	-368.1	0.97
5	HE(1)	N57.07W	175.9	173.7	0.99	-329.5	-319.4	0.97
6	HE(1)	W	61.8	62.4	1.01	-134.7	-127.3	0.95
7	HE(1)*	N	129.2	128.9	1.00	-178.9	-174.7	0.98
8	HE(1)*	W	27.9	28.1	1.01	-60.6	-57.0	0.94
9	HE(3)*	N	83.4	87.3	1.05	-205.7	-197.3	0.96
10	HE(3)*	W	59.6	60.3	1.01	-108.4	-105.8	0.98
11	L(2)	N	260.5	259.9	1.00	-380.7	-372.2	0.98
12	L(2)	N32.93W	226.6	225.1	0.99	-383.5	-373.8	0.97
13	L(2)	N45W	200.6	198.7	0.99	-353.7	-343.9	0.97
14	L(2)	N57.07W	167.5	165.3	0.99	-306.8	-297.4	0.97
15	L(2)	W	56.5	57.0	1.01	-122.8	-116.0	0.94
16	L(2)*	N	119.5	119.2	1.00	-172.0	-168.2	0.98
17	L(2)*	W	24.1	24.3	1.01	-53.0	-50.1	0.95
18	L(4)*	N	112.3	112.0	1.00	-161.8	-158.4	0.98
19	L(4)*	W	22.0	22.3	1.01	-48.8	-46.1	0.94

* Load components marked with a * are combined using the 40-100-40 rule. All others are combined using the 100-40-40 rule.

Table MD-3.4 - PAD RESPONSES - HARD ROCK RESULTS - δ

LS	EQ	Direction	δ_{Max} U,x,y,z	δ_{Max} U,x,z	RATIO x,y/x,y,x	δ_{Cask} U,x,y,z	δ_{Cask} U,x,z	RATIO x,y/x,y,x
1		Gravity	-.000945	-.001015	1.07	-.00296**	-.00300++	1.01
2	HE(1)	N	0.0266	0.0267	1.00	0.00488	0.00494	1.01
3	HE(1)	N32.93W	0.0452	0.0455	1.01	0.0154	0.0156	1.01
4	HE(1)	N45W	0.0462	0.0465	1.01	0.0179	0.0181	1.01
5	HE(1)	N57.07W	0.0428	0.0432	1.01	0.0186	0.0188	1.01
6	HE(1)	W	0.0315	0.0317	1.01	0.0145	0.0146	1.01
7	HE(1)*	N	0.00472	0.00475	1.01	-.000299	-.000279	0.93
8	HE(1)*	W	0.00650	0.00655	1.01	0.00156	0.00159	1.02
9	HE(3)*	N	-0.00110	-0.00115	1.05	-0.00507	-0.00511	1.00
10	HE(3)*	W	-0.00117	-0.00125	1.07	-0.00499	-0.00504	1.01
11	L(2)	N	0.0224	0.0225	1.00	0.00355	0.00359	1.01
12	L(2)	N32.93W	0.0370	0.0373	1.01	0.0114	0.0115	1.01
13	L(2)	N45W	0.0376	0.0379	1.01	0.0133	0.0135	1.02
14	L(2)	N57.07W	0.0347	0.0350	1.01	0.0137	0.0139	1.01
15	L(2)	W	0.0238	0.0240	1.01	0.00990	0.01002	1.01
16	L(2)*	N	0.0102	0.0102	1.00	0.00167	0.00169	1.01
17	L(2)*	W	0.0103	0.0104	1.01	0.00435	0.00440	1.01
18	L(4)*	N	0.0113	0.0113	1.00	0.00254	0.00256	1.01
19	L(4)*	W	0.0142	0.0143	1.01	0.00746	0.00753	1.01

* Load components marked with a * are combined using the 40-100-40 rule. All others are combined using the 100-40-40 rule.

** Values range from -0.00296 to -0.00372 (Perimeter casks only)

++ Values range from -0.00300 to -0.00375 (Perimeter casks only)

Table MD-3.5 - PAD RESPONSES - HARD ROCK RESULTS - σ_X

LS	EQ	Direction	$\sigma_{X\ Max}$ U,x,y,z	$\sigma_{X\ Max}$ U,x,z	RATIO x,y/x,y,x	$\sigma_{X\ Min}$ U,x,y,z	$\sigma_{X\ Min}$ U,x,z	RATIO x,y/x,y,x
1		Gravity	16.2	16.2	1.00	-20.3	-20.1	0.99
2	HE(1)	N	51.3	51.3	1.00	-79.4	-79.4	1.00
3	HE(1)	N32.93W	70.2	70.1	1.00	-131.9	-132.0	1.00
4	HE(1)	N45W	81.0	81.0	1.00	-177.1	-177.2	1.00
5	HE(1)	N57.07W	89.2	89.2	1.00	-210.4	-210.5	1.00
6	HE(1)	W	93.7	93.6	1.00	-244.3	-244.4	1.00
7	HE(1)*	N	19.5	19.5	1.00	-29.4	-29.4	1.00
8	HE(1)*	W	38.7	38.6	1.00	-86.2	-86.3	1.00
9	HE(3)*	N	40.3	40.3	1.00	-43.6	-43.1	0.99
10	HE(3)*	W	62.4	62.4	1.00	-71.3	-70.9	0.99
11	L(2)	N	42.6	42.7	1.00	-68.9	-68.8	1.00
12	L(2)	N32.93W	61.7	61.7	1.00	-110.8	-110.9	1.00
13	L(2)	N45W	71.1	71.1	1.00	-150.6	-150.8	1.00
14	L(2)	N57.07W	78.2	78.2	1.00	-180.7	-180.9	1.00
15	L(2)	W	82.1	82.1	1.00	-209.8	-209.8	1.00
16	L(2)*	N	16.7	16.8	1.01	-28.3	-28.2	0.99
17	L(2)*	W	33.4	33.4	1.00	-86.6	-86.7	1.00
18	L(4)*	N	15.5	15.5	1.00	-25.1	-25.1	1.00
19	L(4)*	W	28.1	28.1	1.00	-80.8	-80.9	1.00

* Load components marked with a * are combined using the 40-100-40 rule. All others are combined using the 100-40-40 rule.

Table MD-3.6 - PAD RESPONSES - HARD ROCK RESULTS - σ_Z

LS	EQ	Direction	$\sigma_{Z\ Max}$ U,x,y,z	$\sigma_{Z\ Max}$ U,x,z	RATIO x,y/x,y,x	$\sigma_{Z\ Min}$ U,x,y,z	$\sigma_{Z\ Min}$ U,x,z	RATIO x,y/x,y,x
1		Gravity	9.08	9.28	1.02	-18.8	-18.5	0.98
2	HE(1)	N	75.0	75.6	1.01	-195.7	-195.7	1.00
3	HE(1)	N32.93W	70.8	71.0	1.00	-167.6	-167.7	1.00
4	HE(1)	N45W	62.8	62.7	1.00	-137.5	-137.6	1.00
5	HE(1)	N57.07W	59.7	59.6	1.00	-103.5	-103.5	1.00
6	HE(1)	W	51.7	51.7	1.00	-76.7	-76.7	1.00
7	HE(1)*	N	31.3	31.4	1.00	-56.5	-56.1	0.99
8	HE(1)*	W	18.6	18.7	1.01	-31.3	-31.2	1.00
9	HE(3)*	N	36.9	37.2	1.01	-77.9	-77.2	0.99
10	HE(3)*	W	27.2	27.5	1.01	-43.1	-42.6	0.99
11	L(2)	N	62.5	63.0	1.01	-166.1	-166.1	1.00
12	L(2)	N32.93W	59.7	59.9	1.00	-147.2	-147.2	1.00
13	L(2)	N45W	54.2	54.2	1.00	-121.9	-121.9	1.00
14	L(2)	N57.07W	51.4	51.4	1.00	-93.0	-93.1	1.00
15	L(2)	W	41.0	41.2	1.00	-68.1	-68.0	1.00
16	L(2)*	N	24.9	24.9	1.00	-70.0	-70.0	1.00
17	L(2)*	W	16.4	16.5	1.01	-27.9	-27.9	1.00
18	L(4)*	N	23.2	23.2	1.00	-65.9	-65.9	1.00
19	L(4)*	W	16.4	16.4	1.00	-23.1	-23.1	1.00

* Load components marked with a * are combined using the 40-100-40 rule. All others are combined using the 100-40-40 rule.

Table MD-3.7 - ROCK RESPONSES - STRESS RESULTS - σ_Y

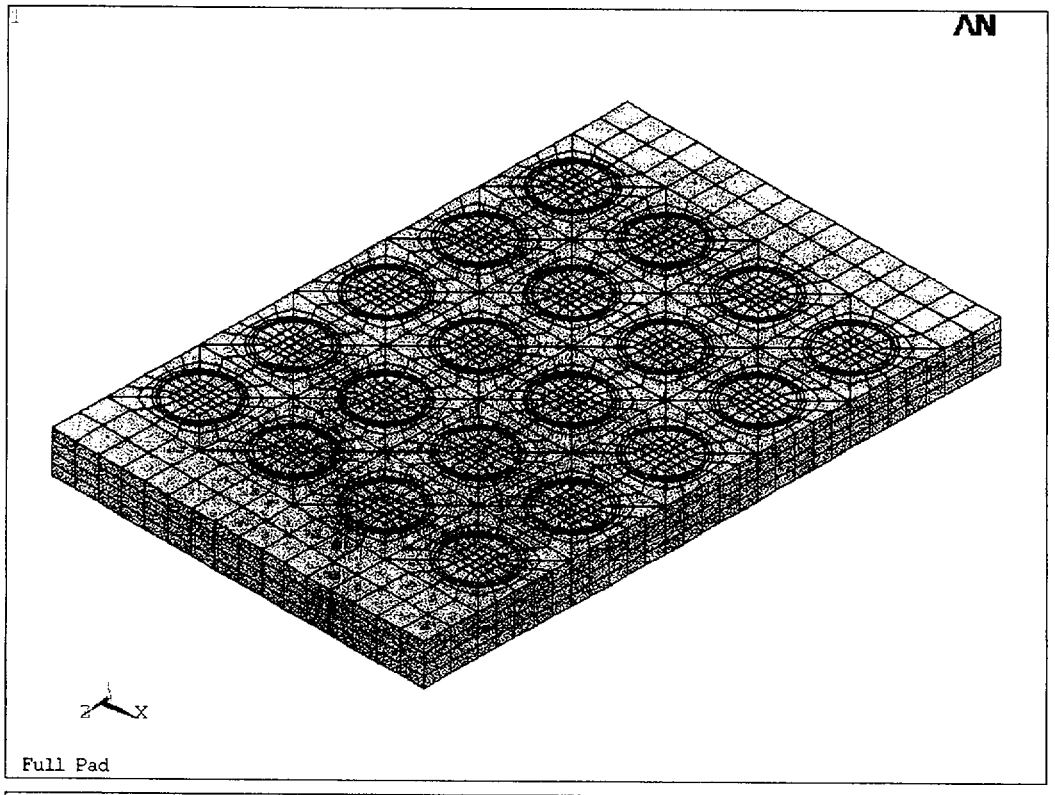
LS	EQ	Direction	SOFT ROCK			HARD ROCK		
			$\sigma_{Y\ Max}$ U,x,y,z	$\sigma_{Y\ Max}$ U,x,z	RATIO x,y/x,y,x	$\sigma_{Y\ Max}$ U,x,y,z	$\sigma_{Y\ Max}$ U,x,z	RATIO x,y/x,y,x
1		Gravity	-15.72	-15.79	1.00	-16.32	-16.34	1.00
2	HE(1)	N	-18.25	-18.25	1.00	-20.38	-20.57	1.01
3	HE(1)	N32.93W	-21.72	-21.66	1.00	-25.06	-25.04	1.00
4	HE(1)	N45W	-24.20	-24.06	0.99	-27.92	-27.90	1.00
5	HE(1)	N57.07W	-26.36	-26.19	0.99	-30.61	-30.59	1.00
6	HE(1)	W	-29.31	-29.12	0.99	-34.28	-34.26	1.00
7	HE(1)*	N	-8.77	-8.60	0.98	-9.60	-9.69	1.01
8	HE(1)*	W	-13.39	-13.31	0.99	-15.39	-15.39	1.00
9	HE(3)*	N	-28.94	-29.06	1.00	-30.10	-30.13	1.00
10	HE(3)*	W	-32.05	-31.88	0.99	-34.13	-34.11	1.00
11	L(2)	N	-16.65	-16.65	1.00	-17.93	-18.13	1.01
12	L(2)	N32.93W	-19.61	-19.68	1.00	-22.38	-22.36	1.00
13	L(2)	N45W	-21.78	-21.65	0.99	-24.93	-24.91	1.00
14	L(2)	N57.07W	-23.71	-23.56	0.99	-27.35	-27.34	1.00
15	L(2)	W	-26.32	-26.15	0.99	-30.55	-30.53	1.00
16	L(2)*	N	-7.17	-7.17	1.00	-7.16	-7.27	1.02
17	L(2)*	W	-10.95	-10.87	0.99	-12.64	-12.63	1.00
18	L(4)*	N	-6.63	-6.63	1.00	-6.11	-6.17	1.01
19	L(4)*	W	-9.44	-9.38	0.99	-10.93	-10.92	1.00

* Load components marked with a * are combined using the 40-100-40 rule. All others are combined using the 100-40-40 rule.

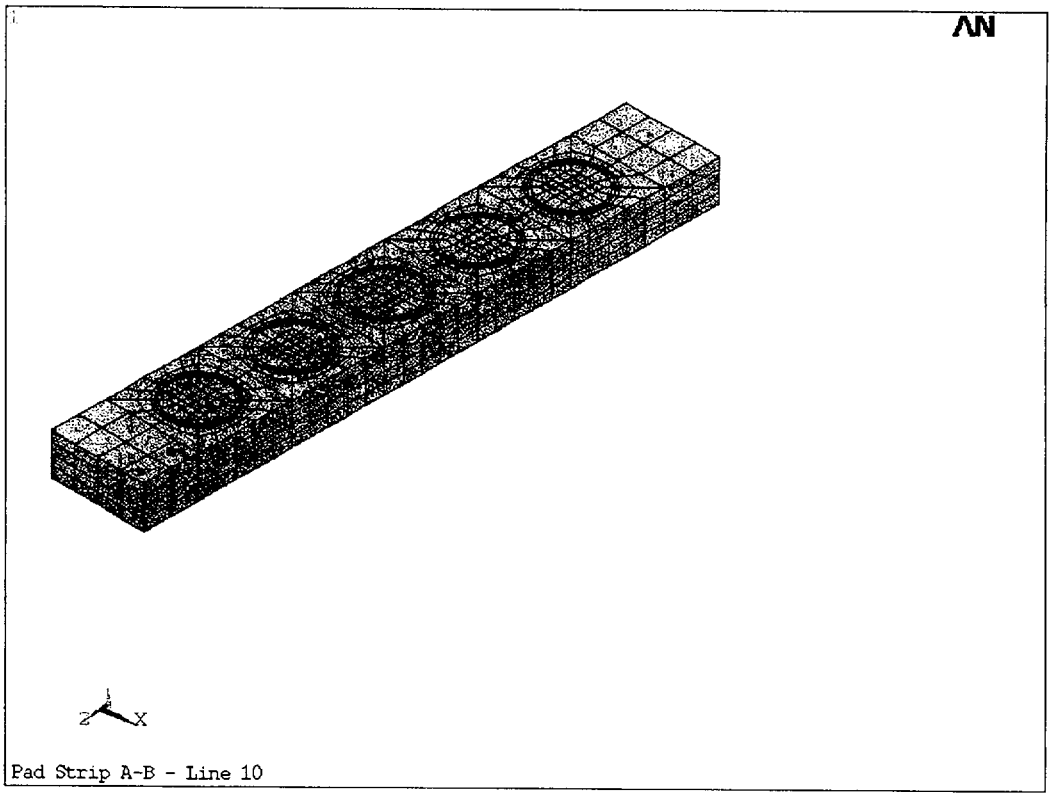
Originator: S. C. Tumminelli
Date: November 30, 2001

Appendix MD-4

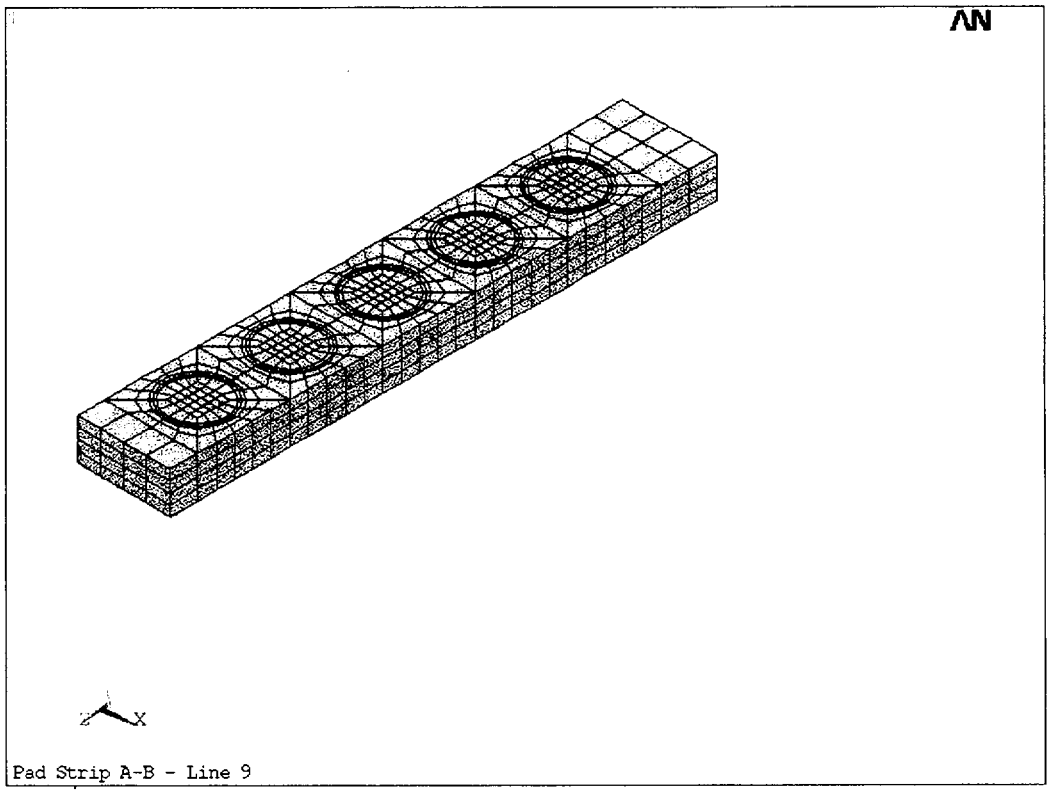
This Appendix presents the pad strips and sections, called lines, for the pad. The internal forces and moments are computed at these locations. The plots are followed by the ANSYS input file that created them. This file is a modification of the file used to compute the forces in Appendices FC-1 and FC-2. The file begins on page 35.

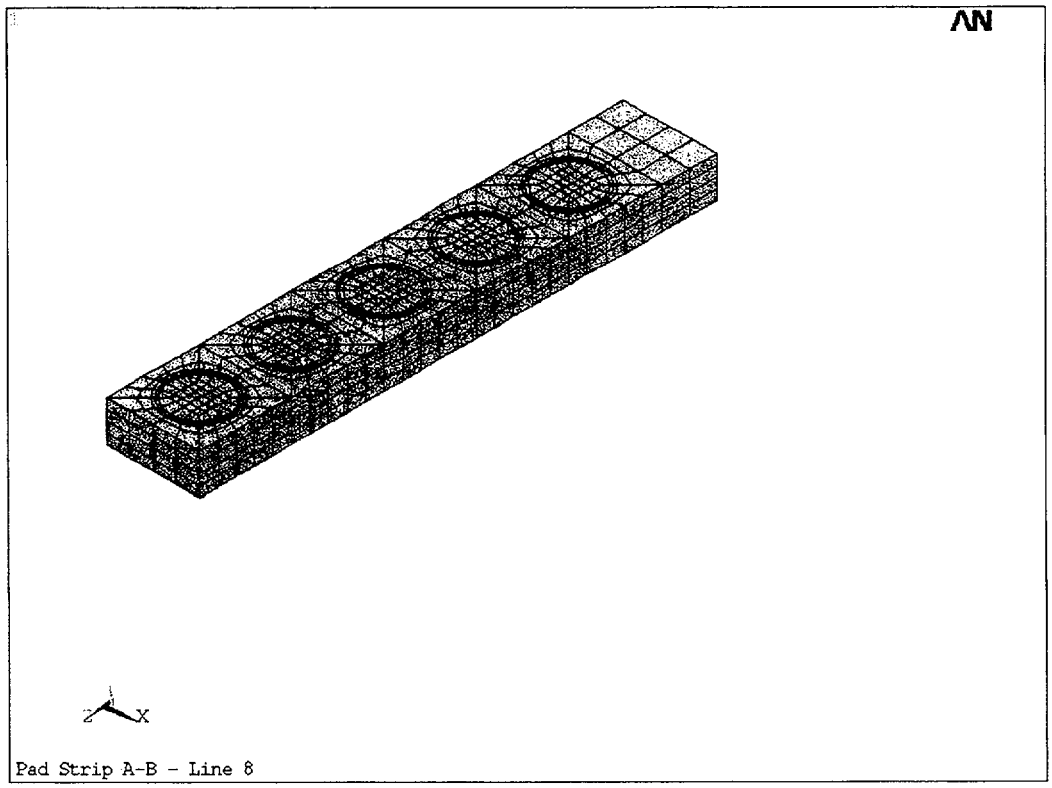


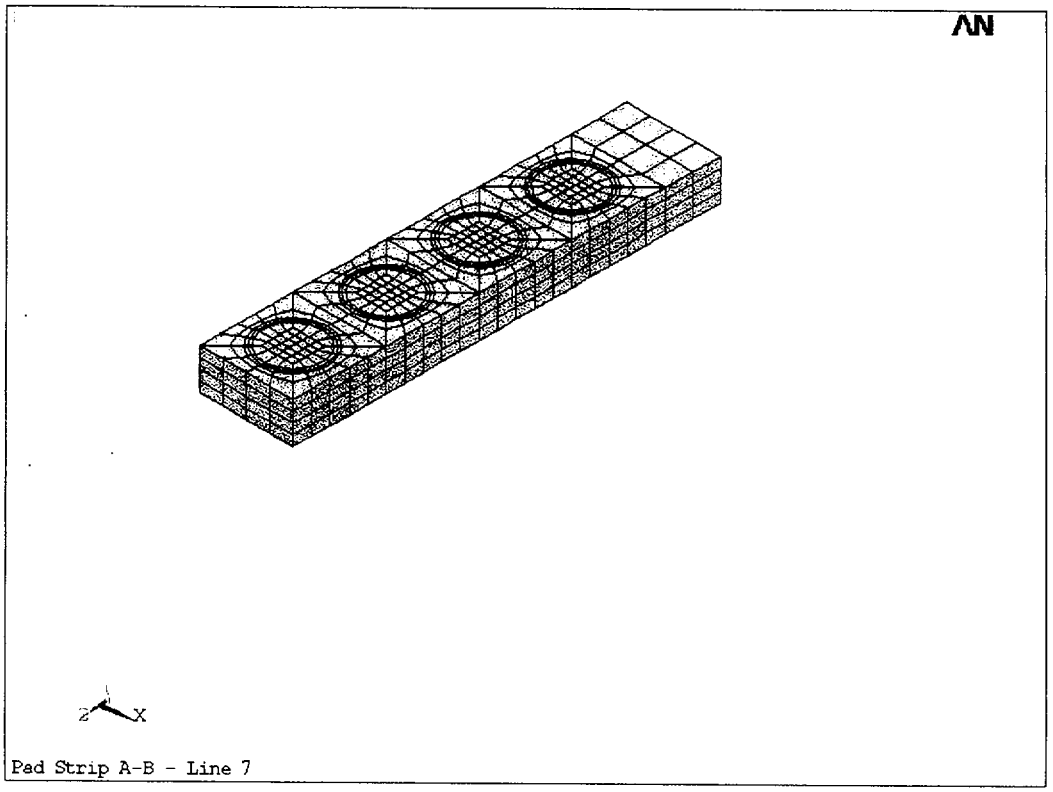
Full Pad



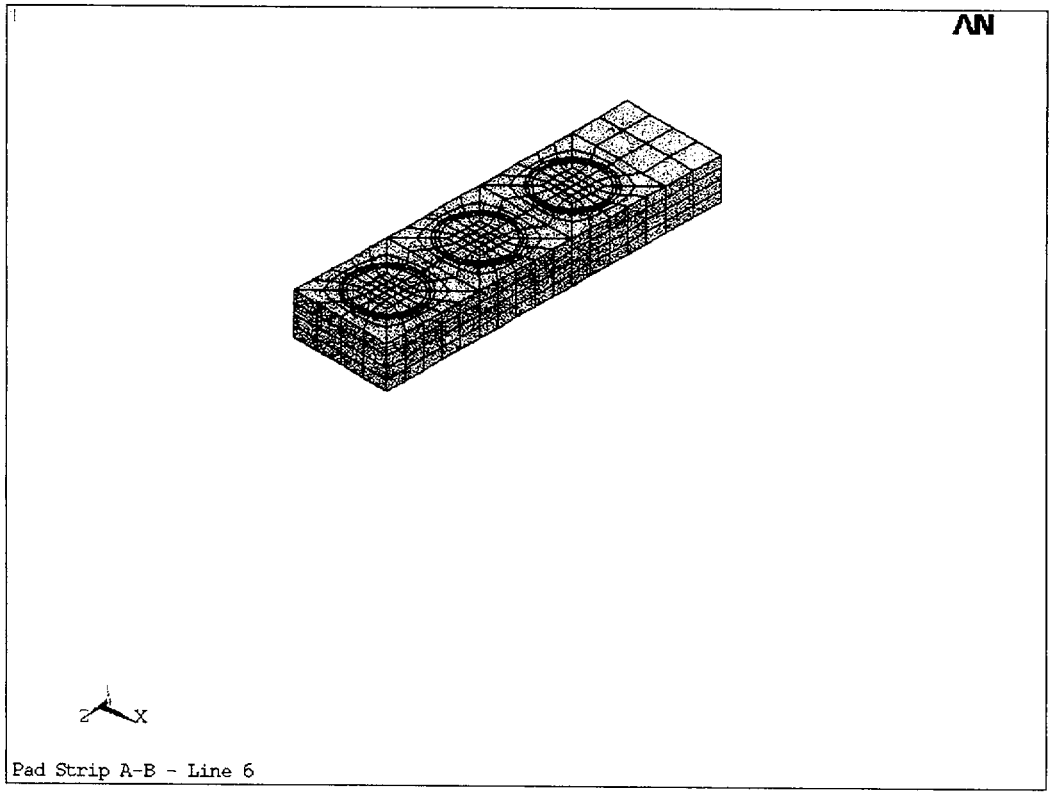
Pad Strip A-B - Line 10


AN
Z
X
Pad Strip A-B - Line 9

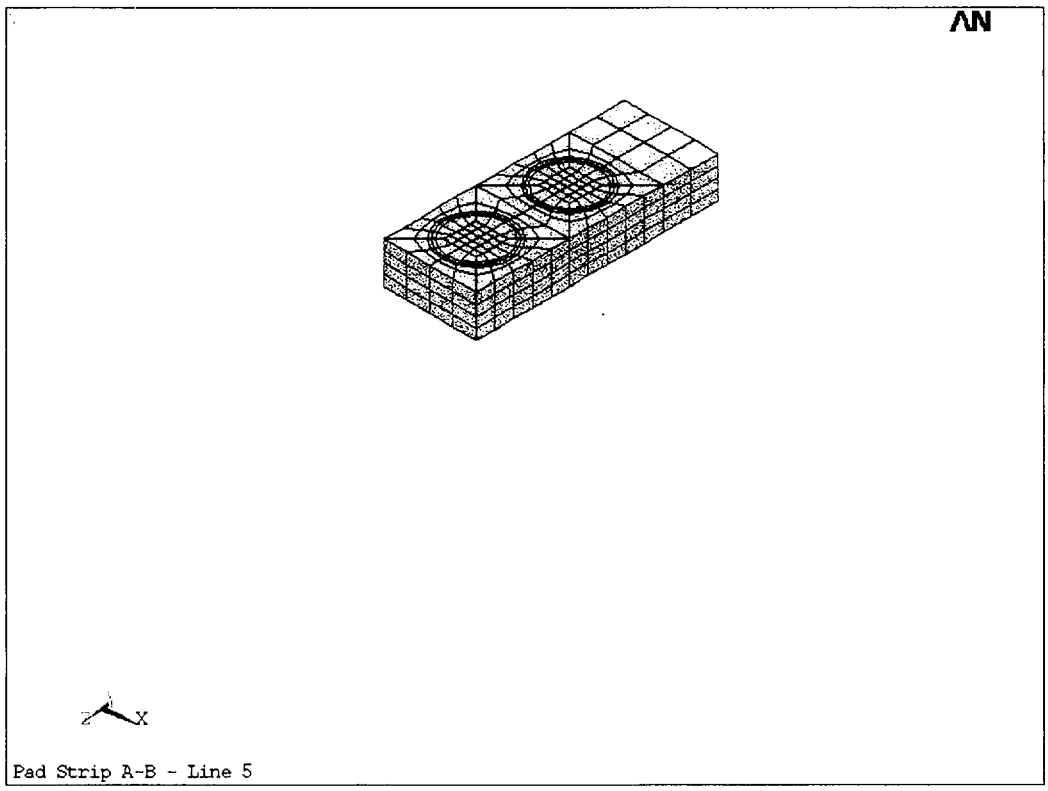

AN
Z
X
Pad Strip A-B - Line 8



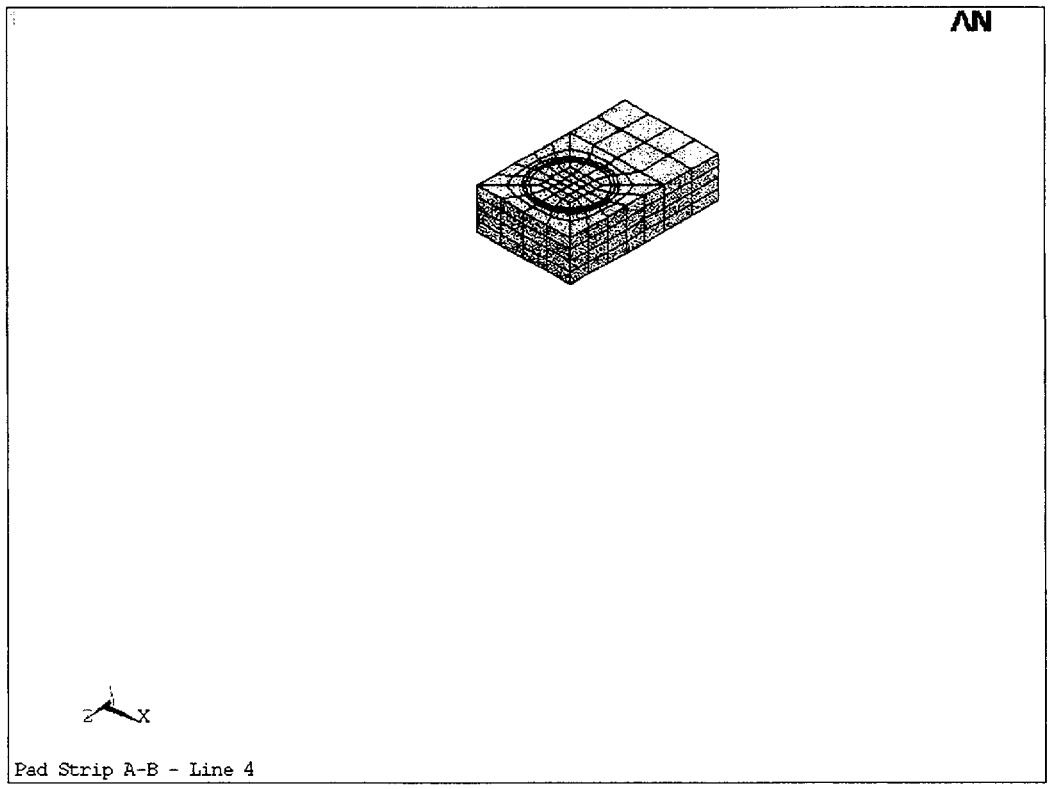
Pad Strip A-B - Line 7



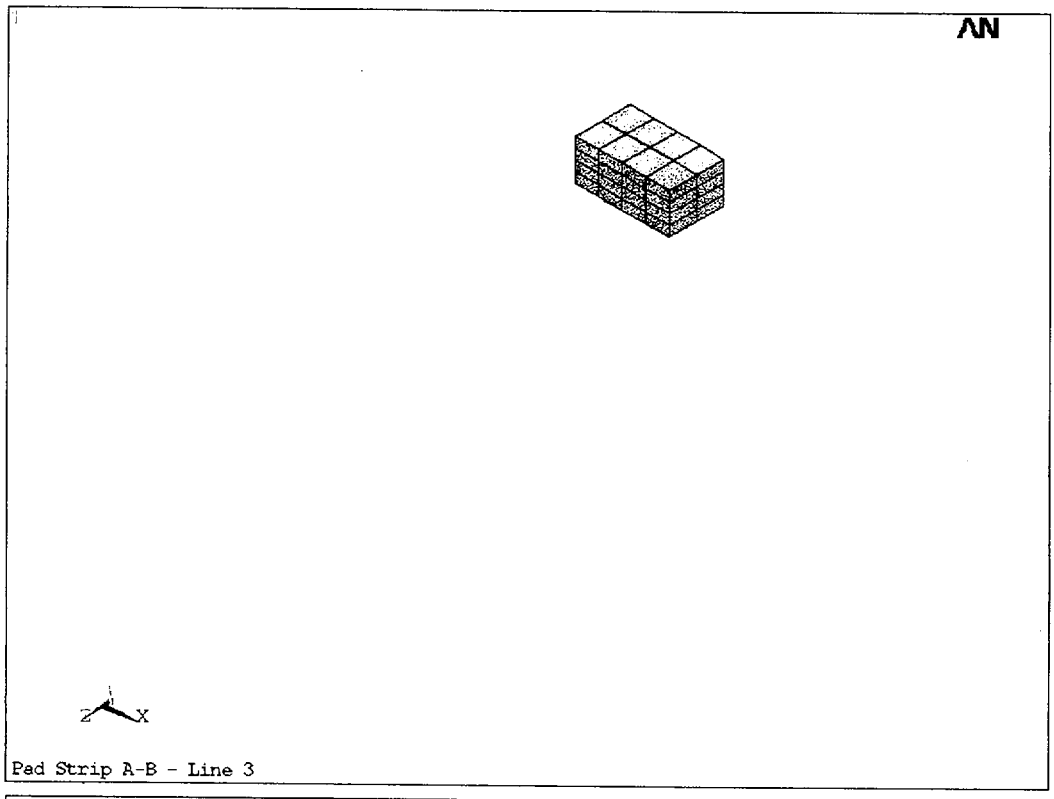
Pad Strip A-B - Line 6



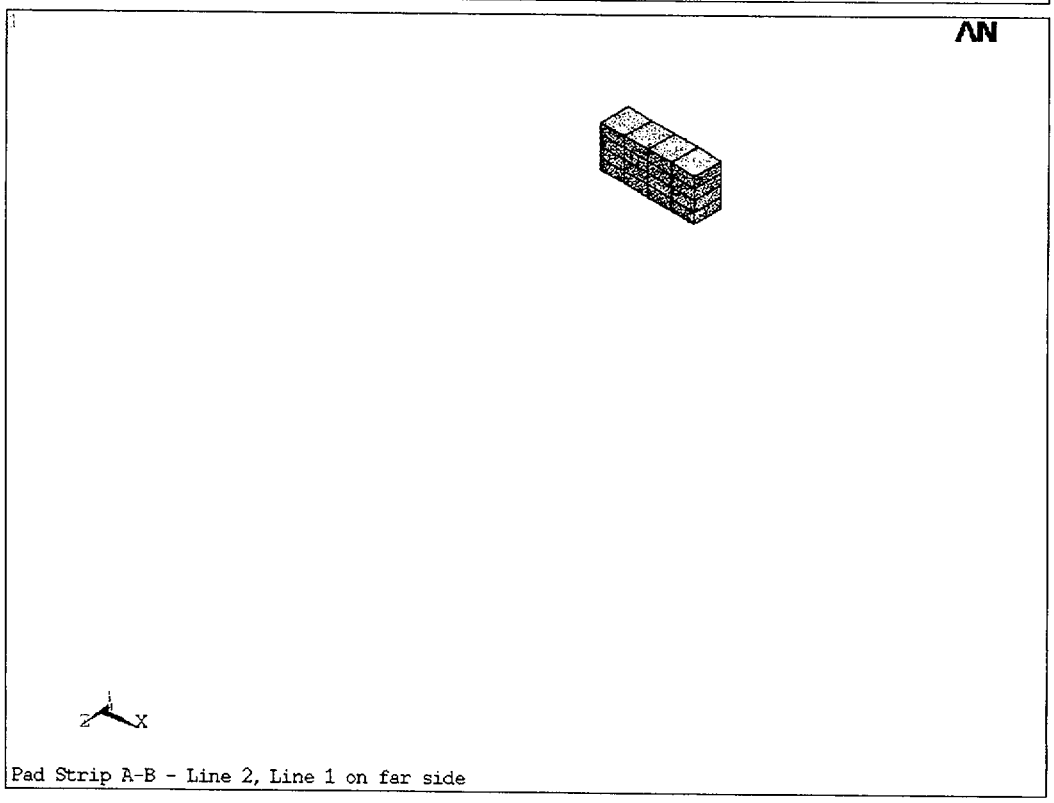
Pad Strip A-B - Line 5



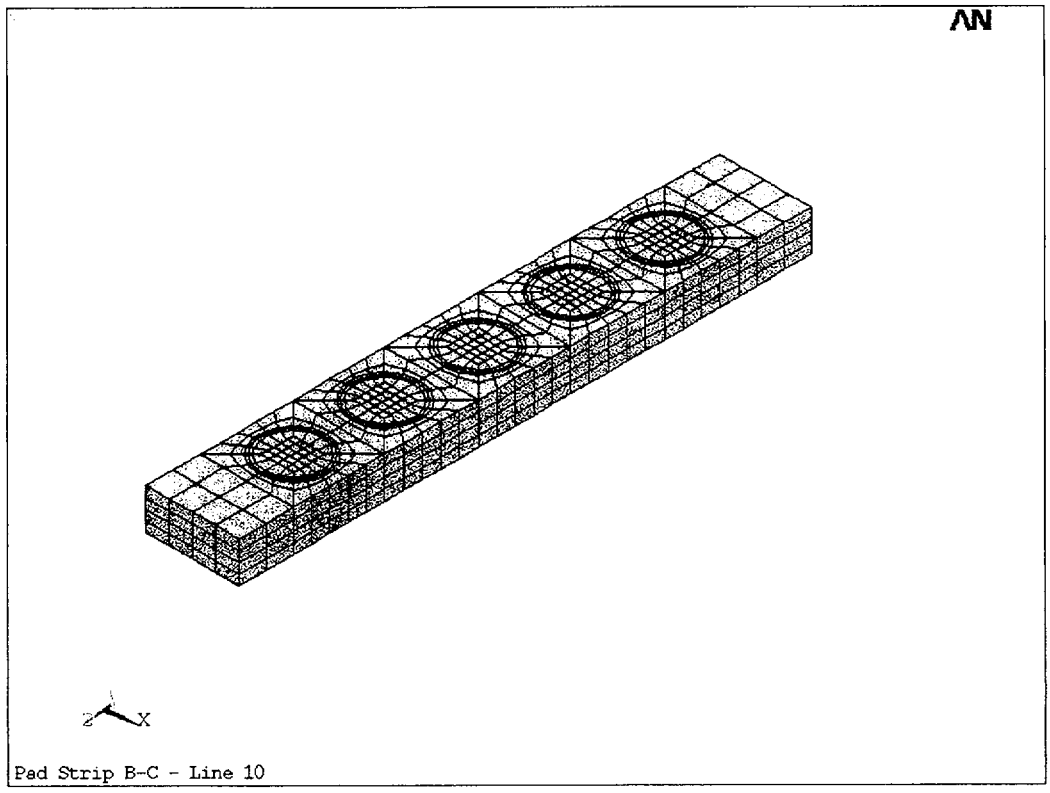
Pad Strip A-B - Line 4

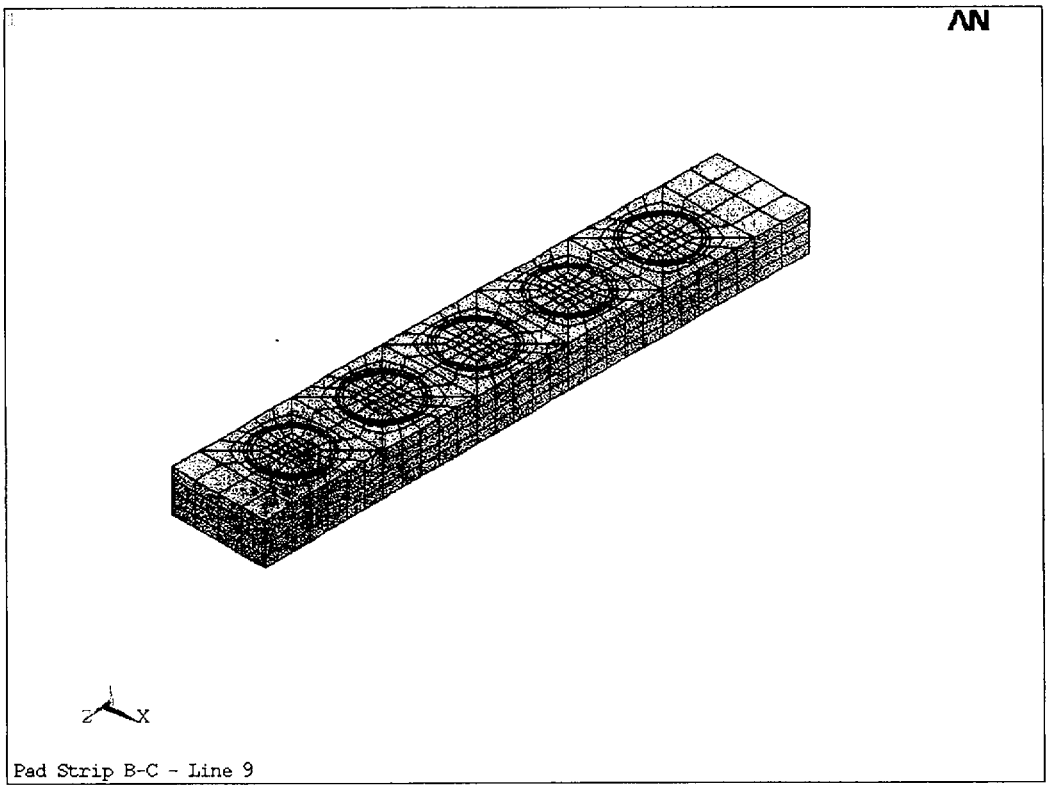


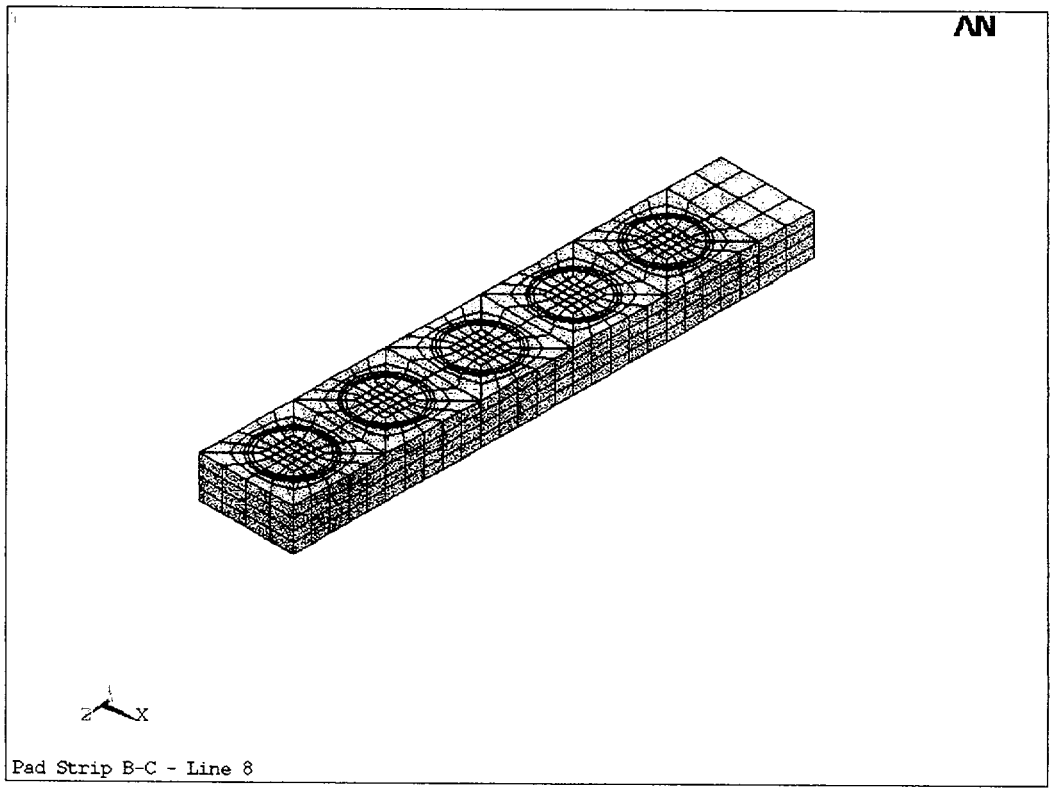
Pad Strip A-B - Line 3

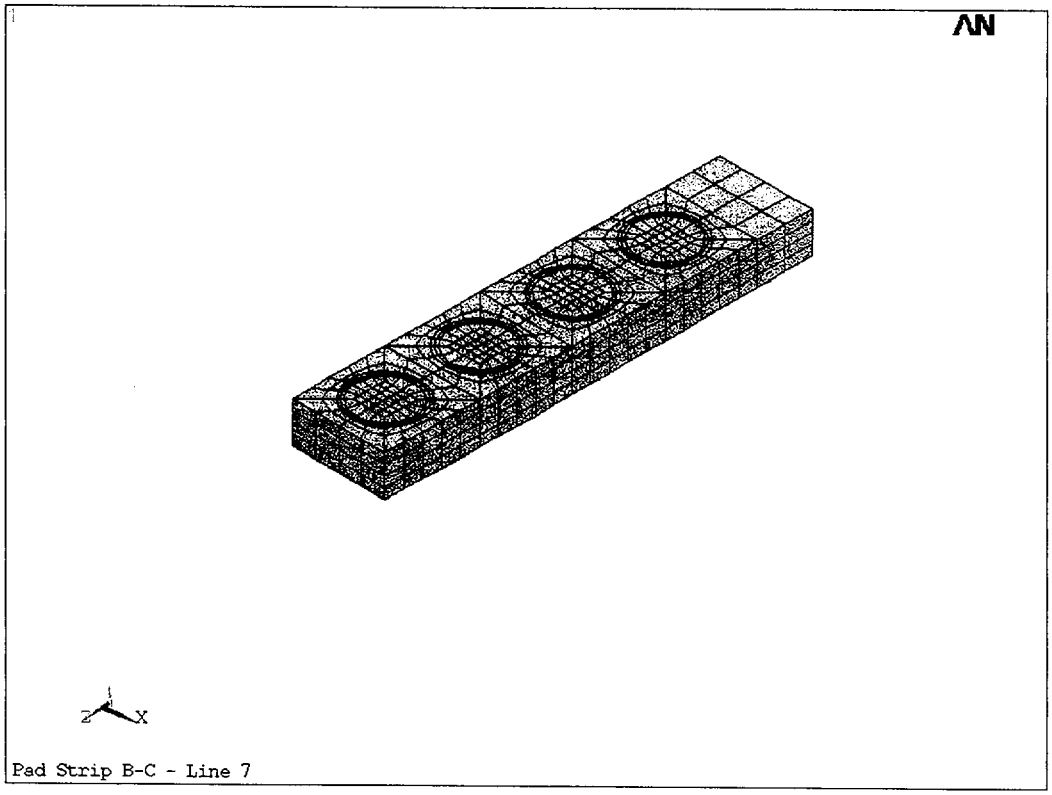


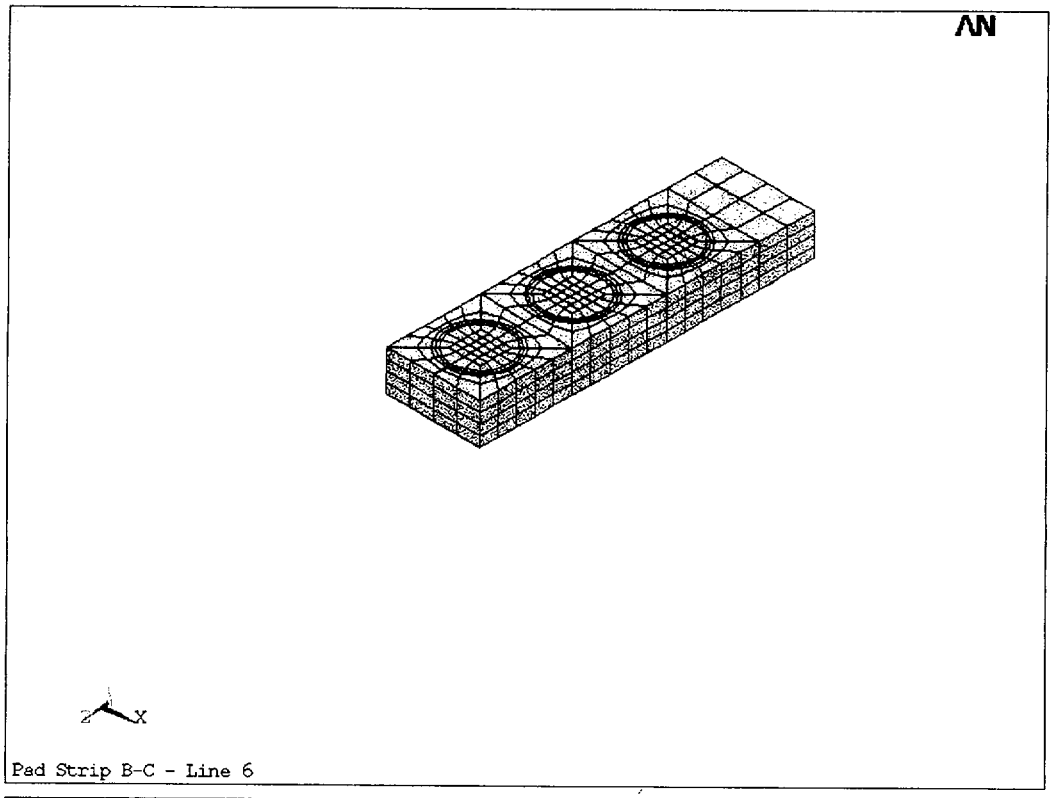
Pad Strip A-B - Line 2, Line 1 on far side


AN
Z
X
Pad Strip B-C - Line 10

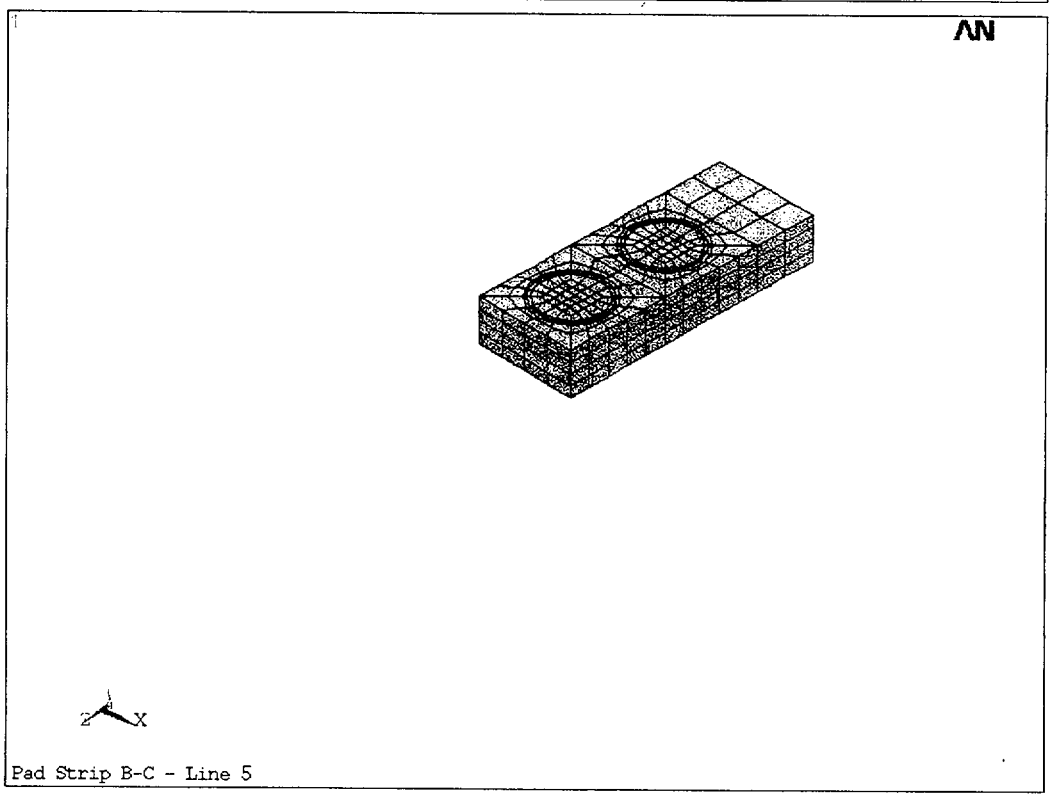

AN
Z
X
Pad Strip B-C - Line 9


AN
Z
X
Pad Strip B-C - Line 8

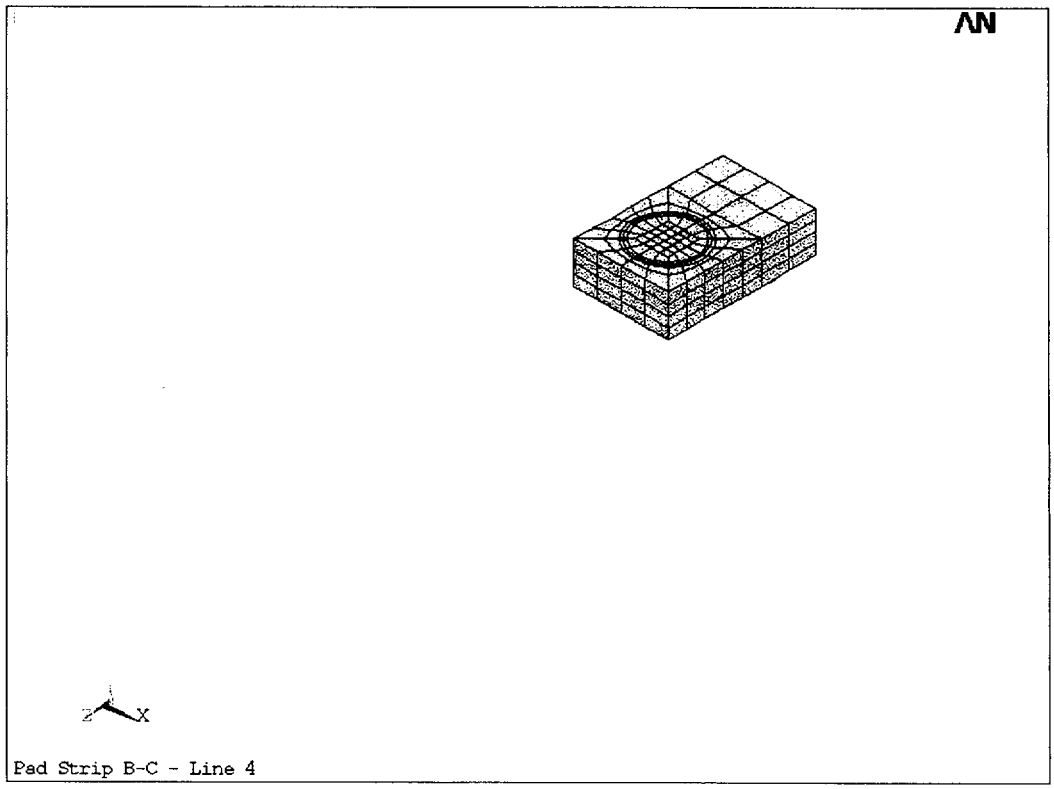

AN
Z
X
Pad Strip B-C - Line 7



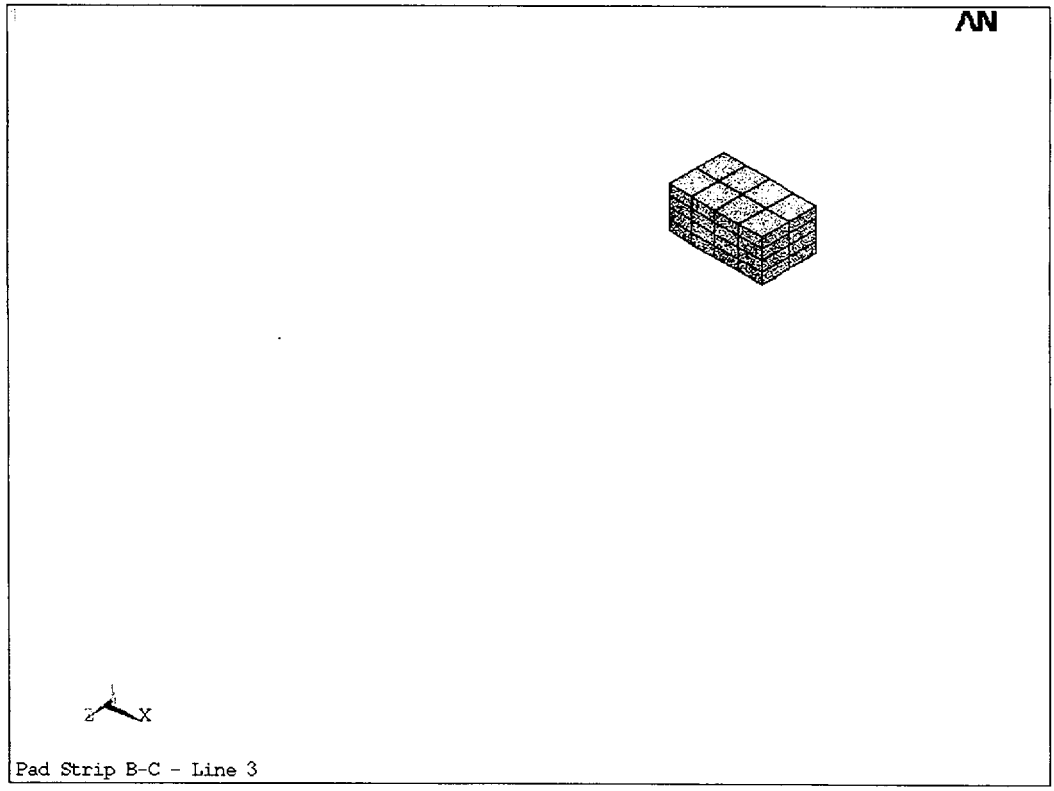
Pad Strip B-C - Line 6



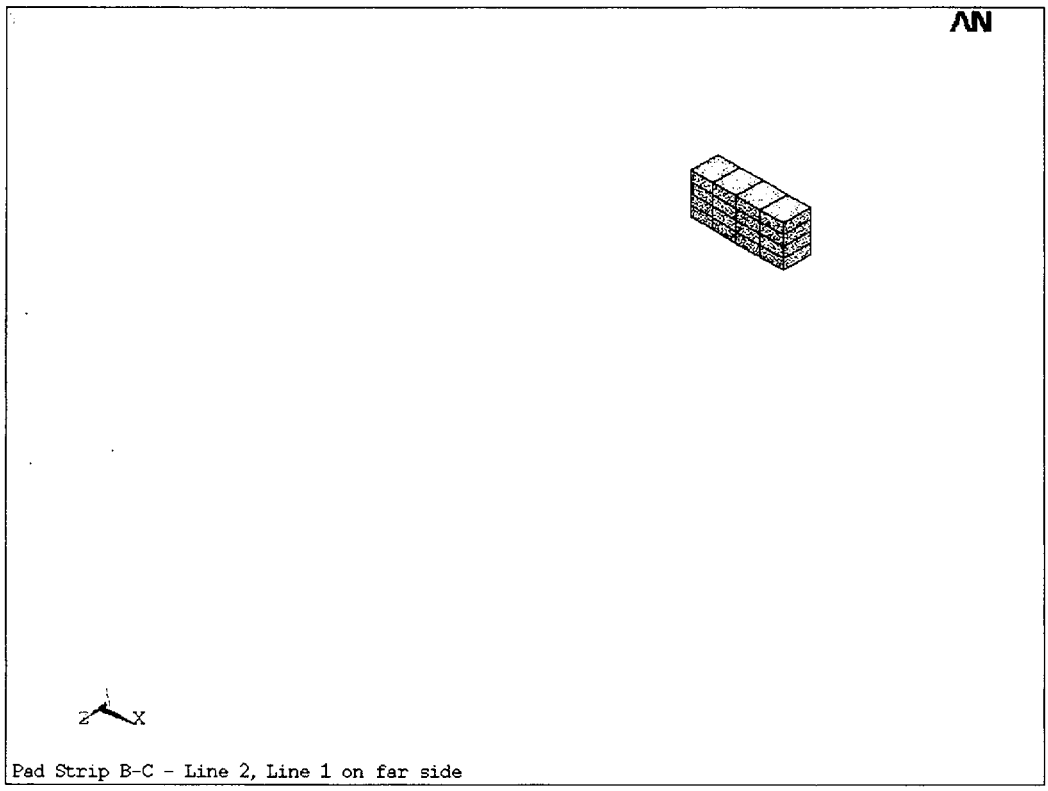
Pad Strip B-C - Line 5



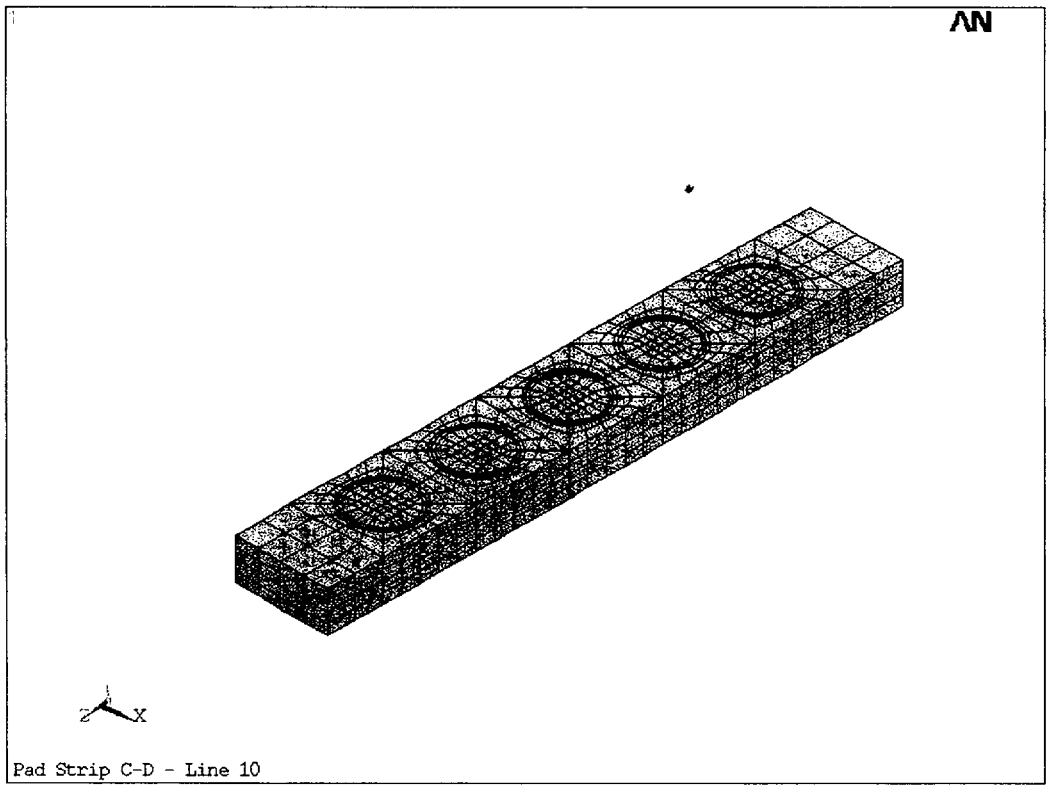
Pad Strip B-C - Line 4



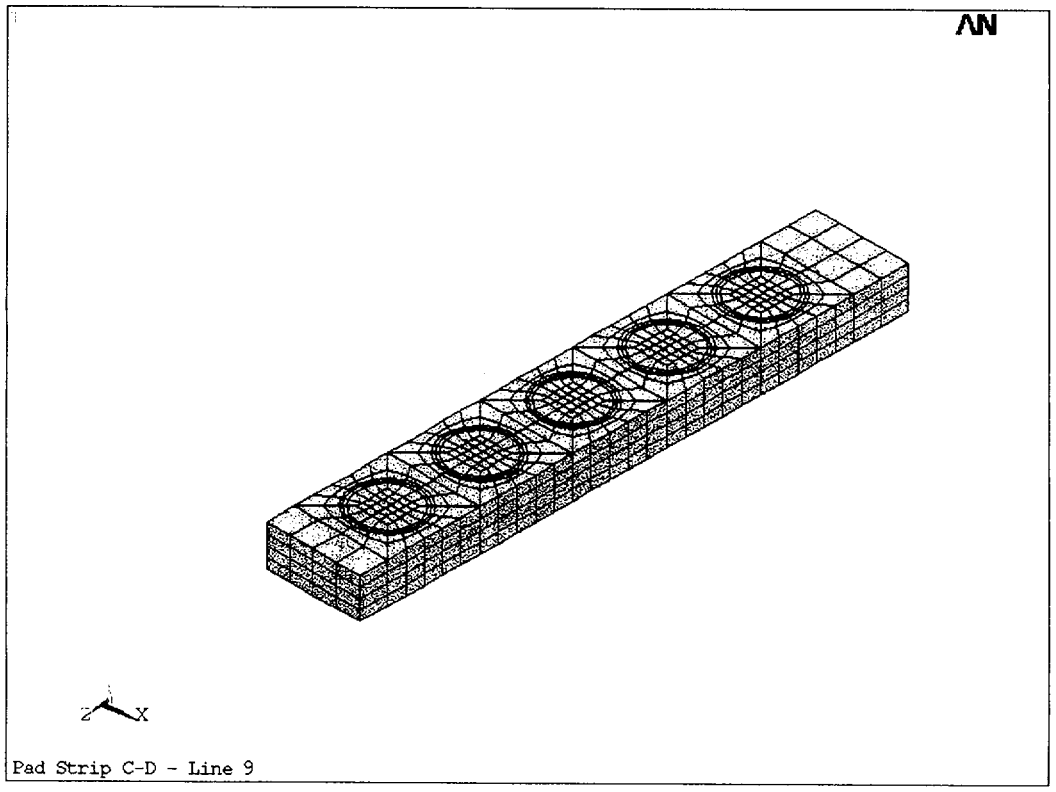
Pad Strip B-C - Line 3

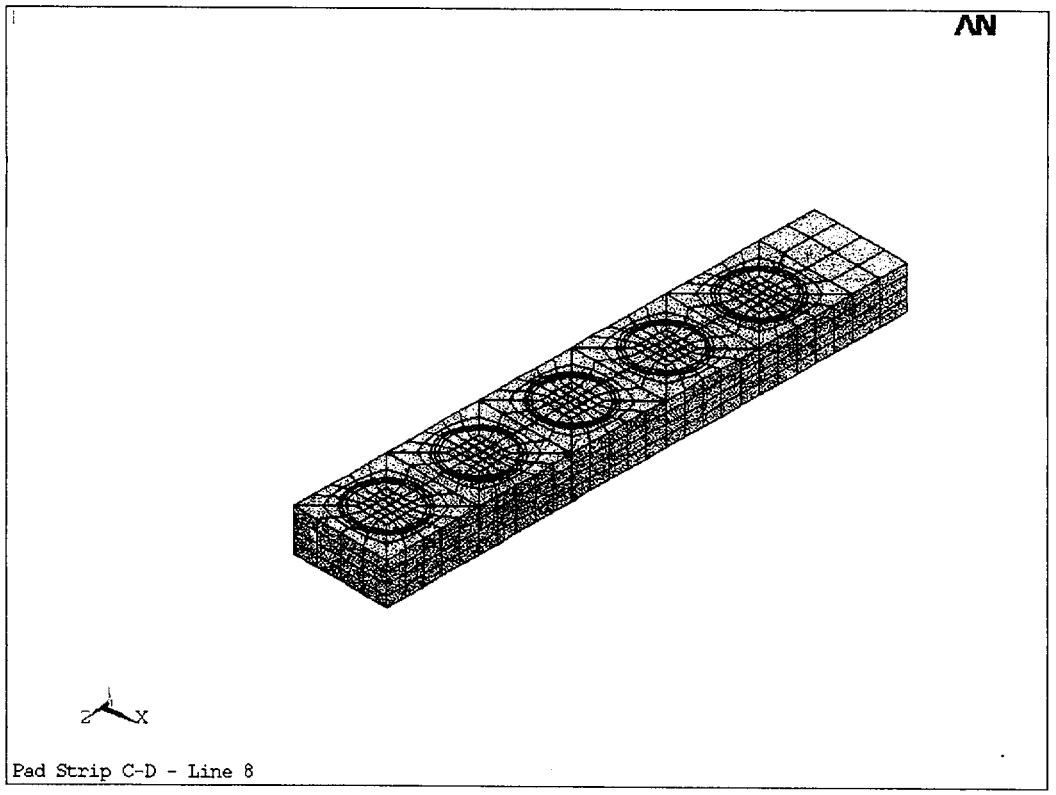


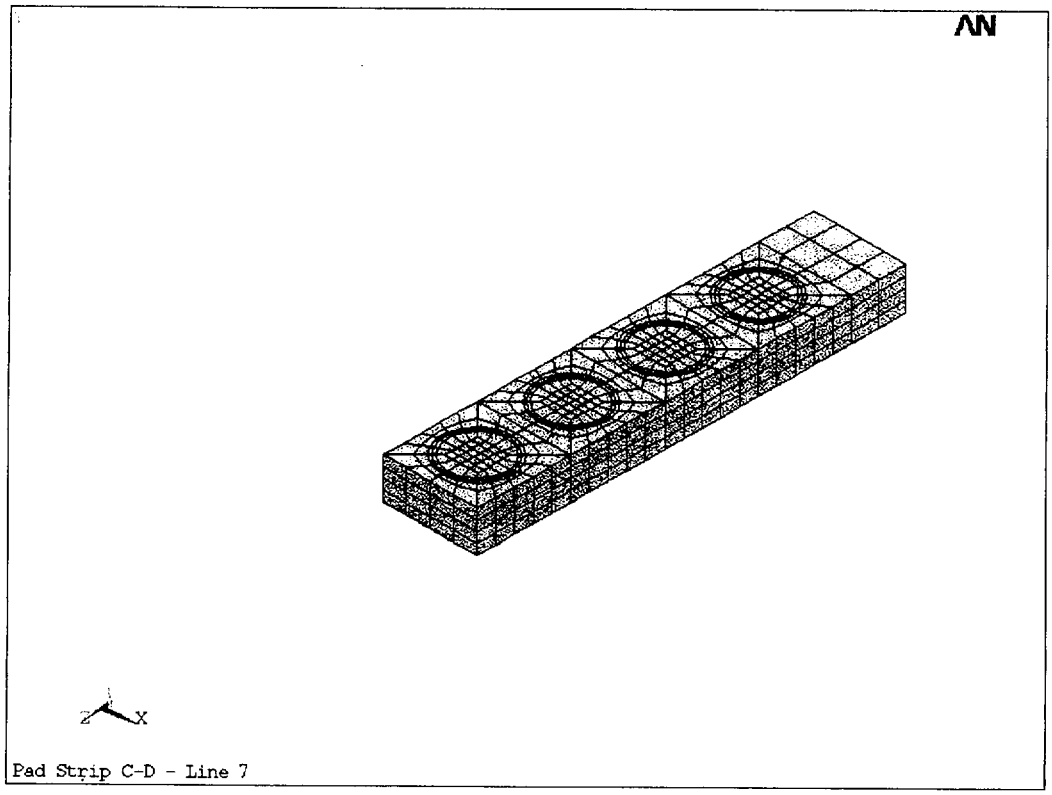
Pad Strip B-C - Line 2, Line 1 on far side



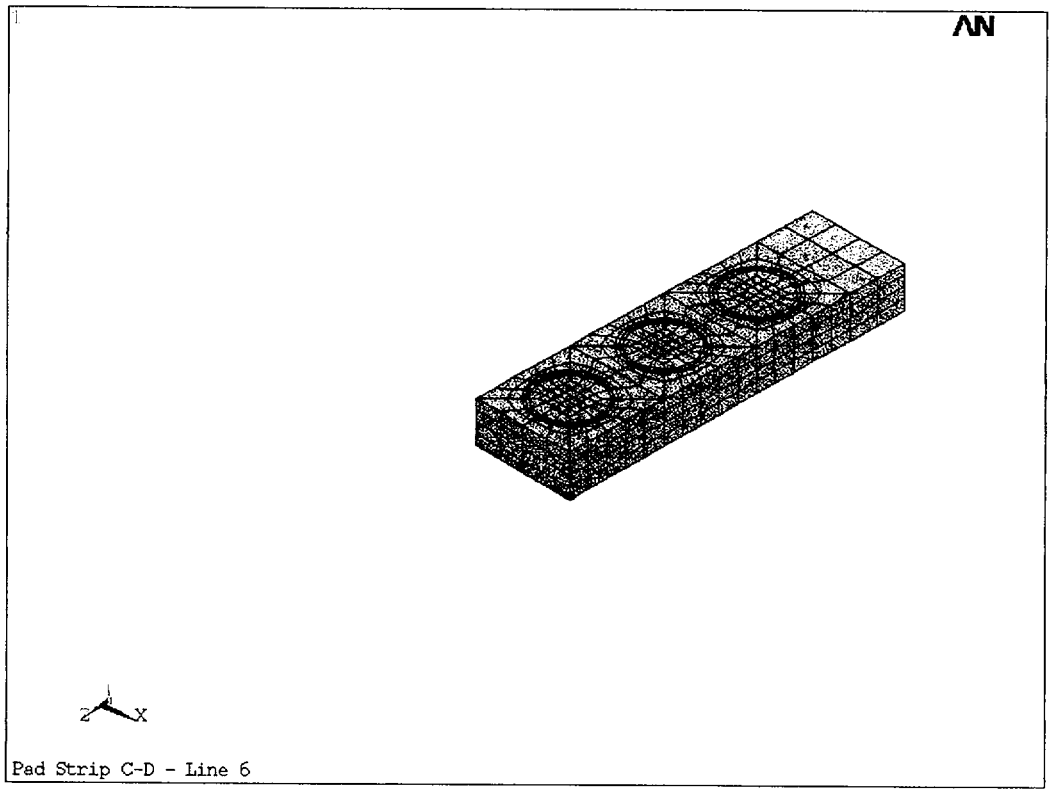
Pad Strip C-D - Line 10


AN
Z
X
Pad Strip C-D - Line 9

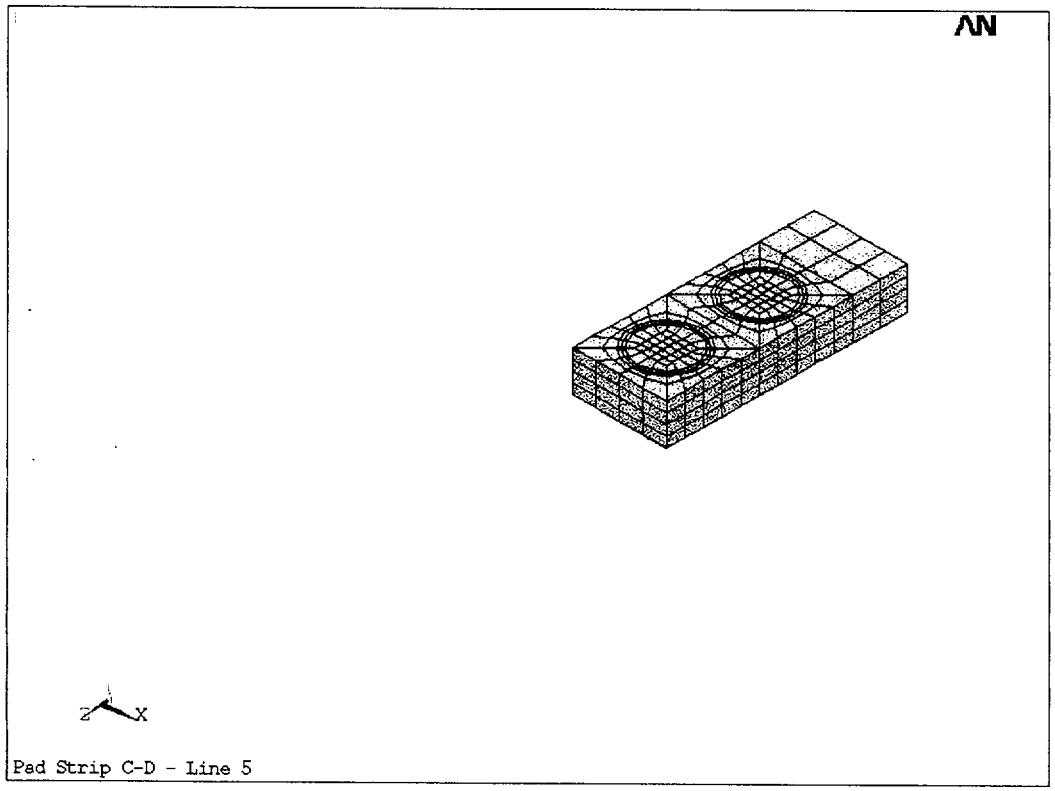

AN
Z
X
Pad Strip C-D - Line 8



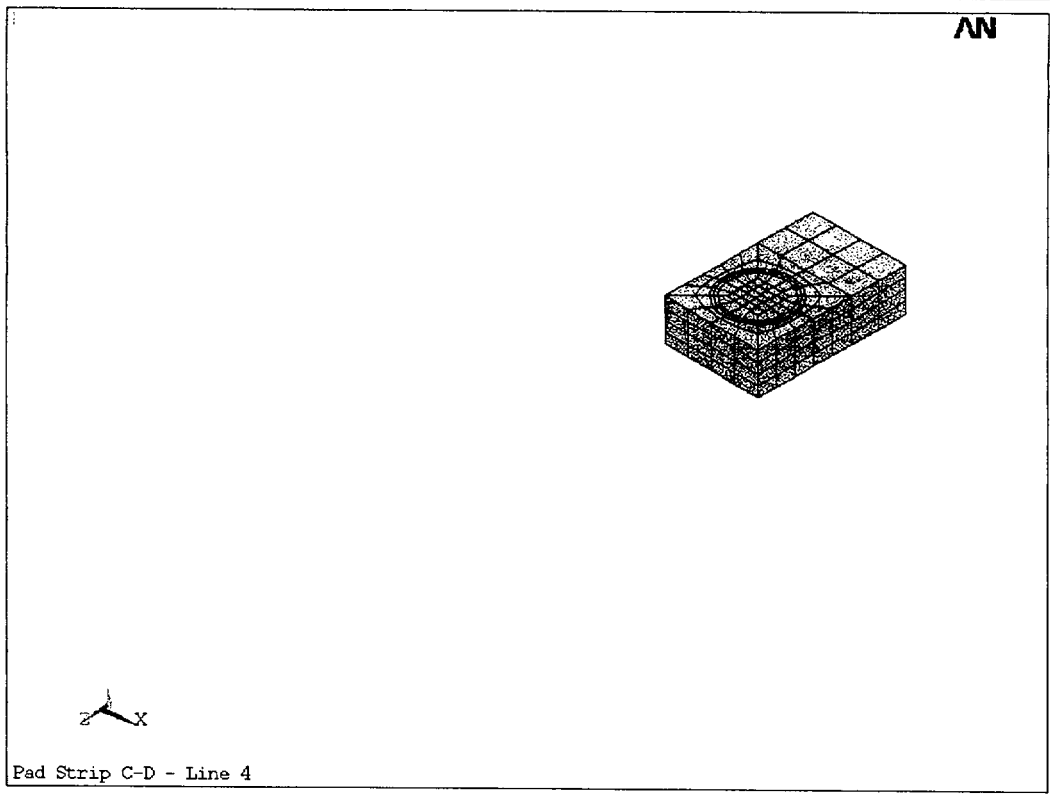
Pad Strip C-D - Line 7



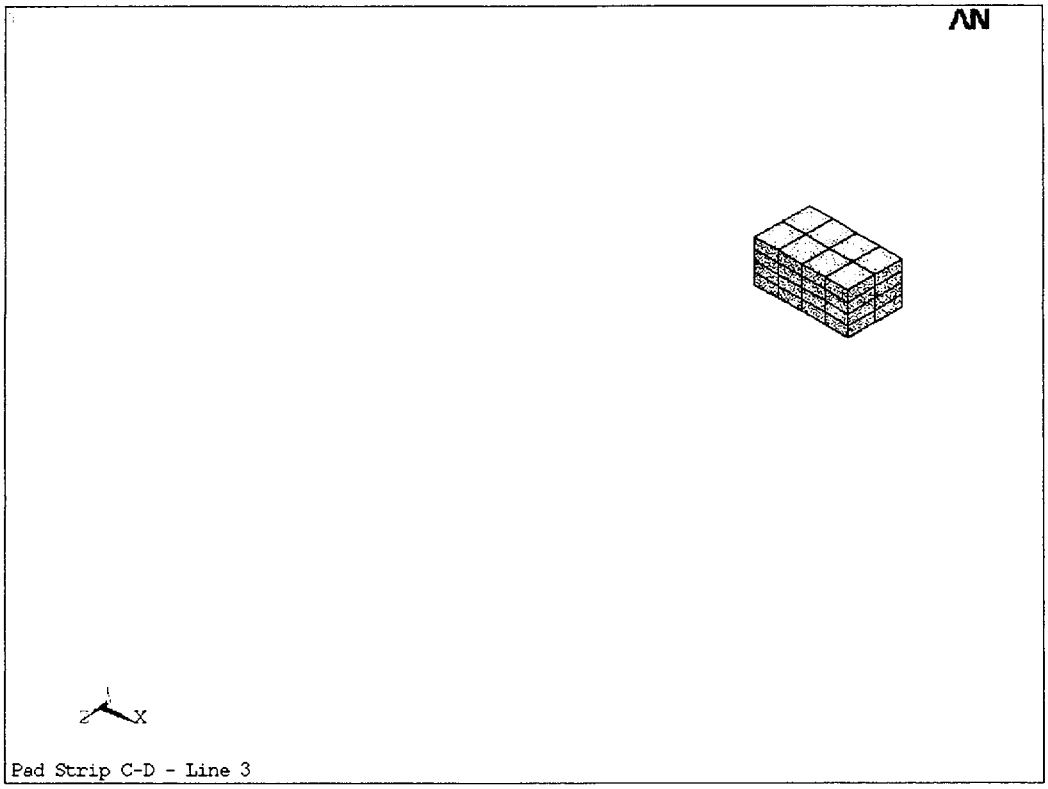
Pad Strip C-D - Line 6



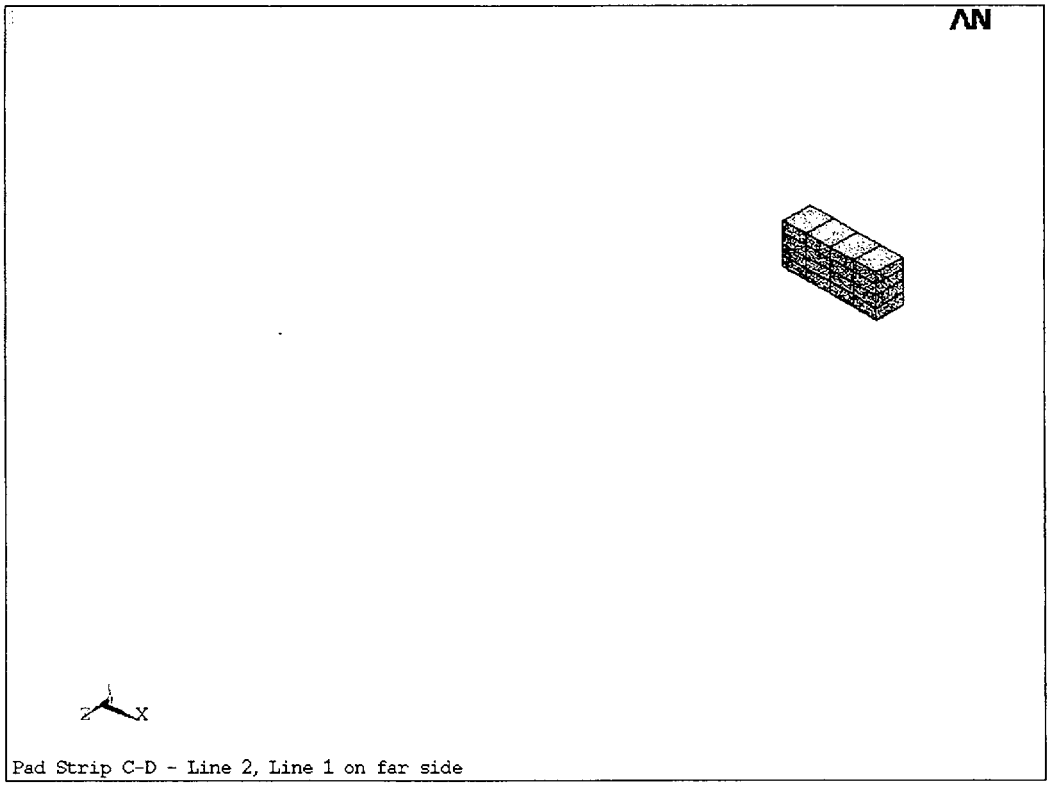
Pad Strip C-D - Line 5



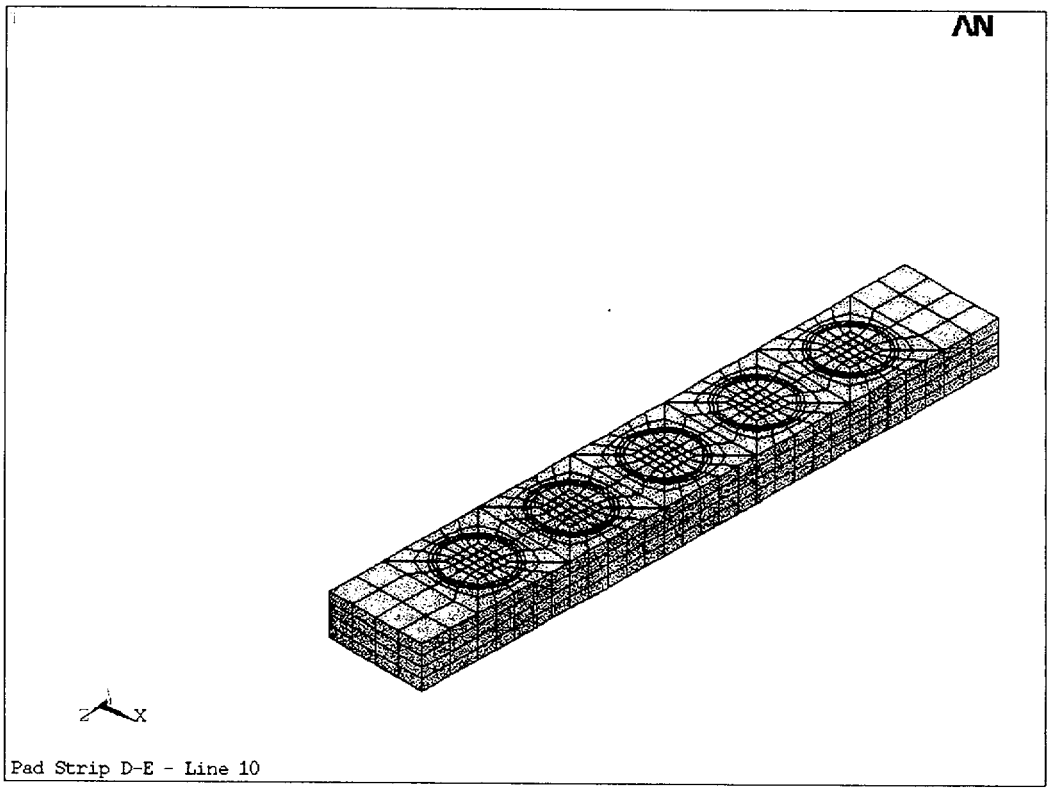
Pad Strip C-D - Line 4



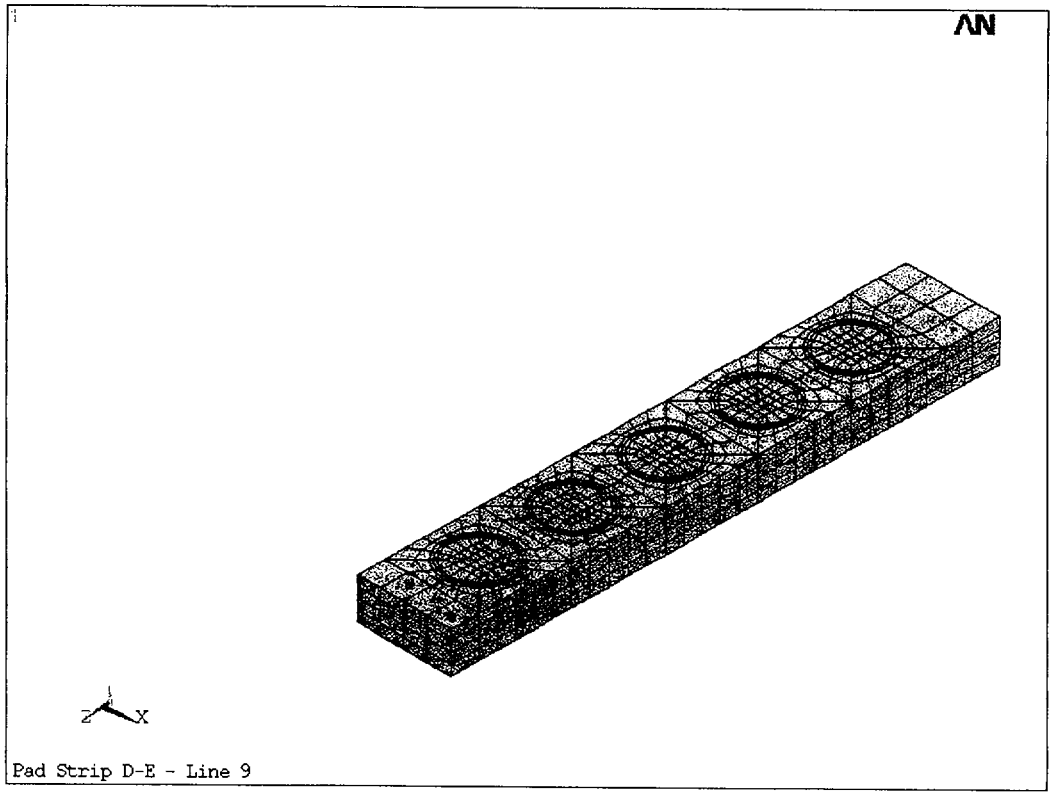
Pad Strip C-D - Line 3



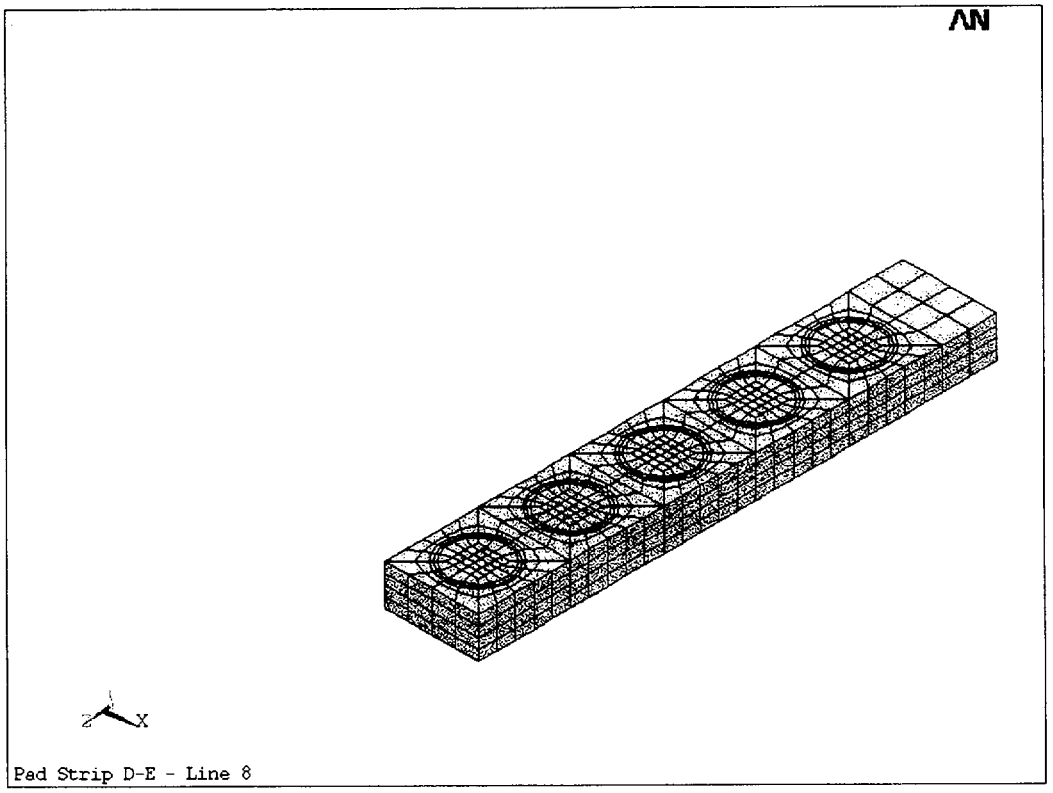
Pad Strip C-D - Line 2, Line 1 on far side



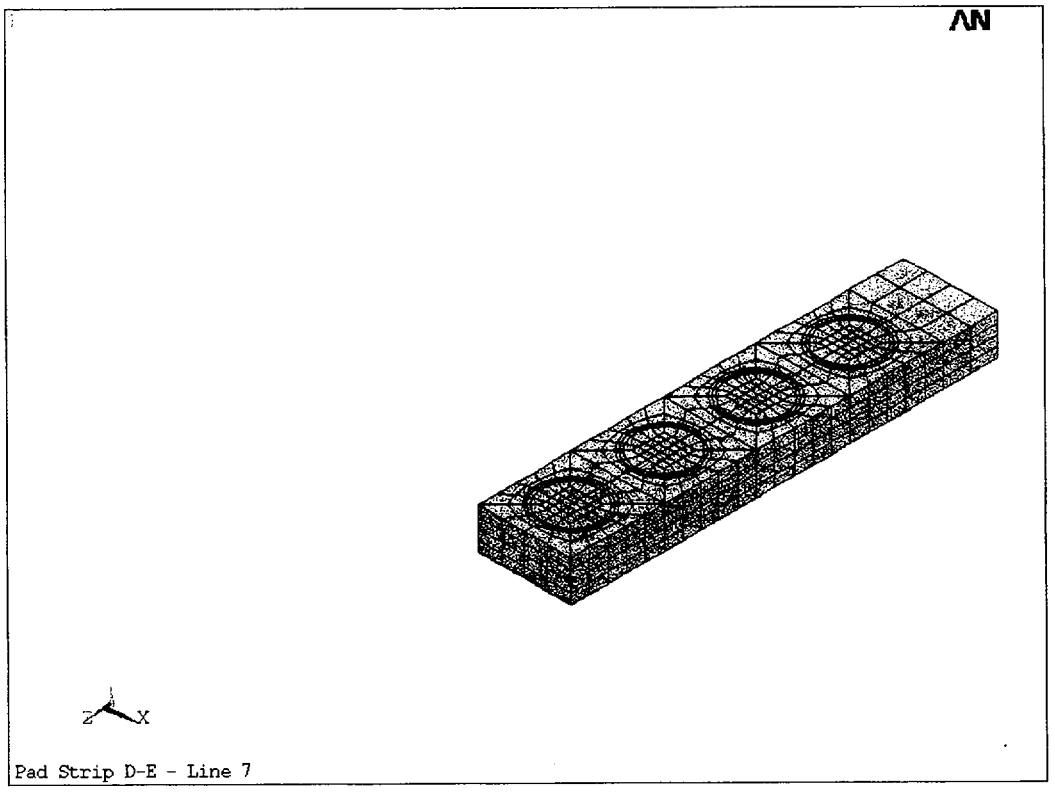
Pad Strip D-E - Line 10



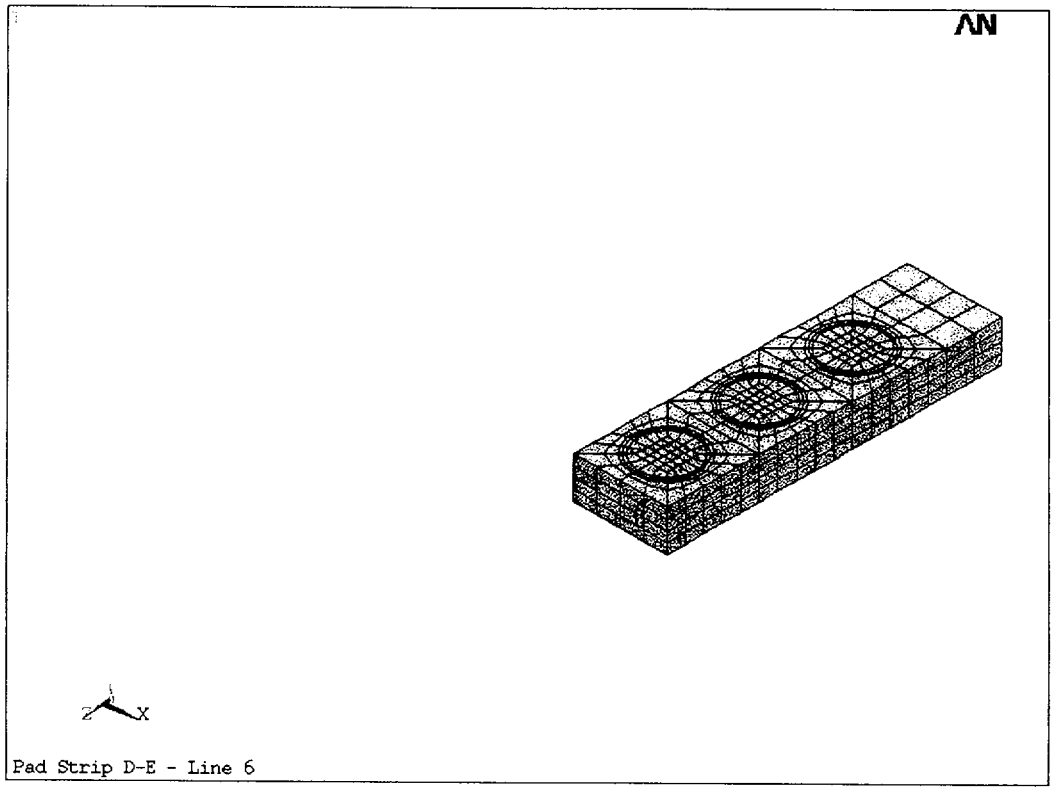
Pad Strip D-E - Line 9

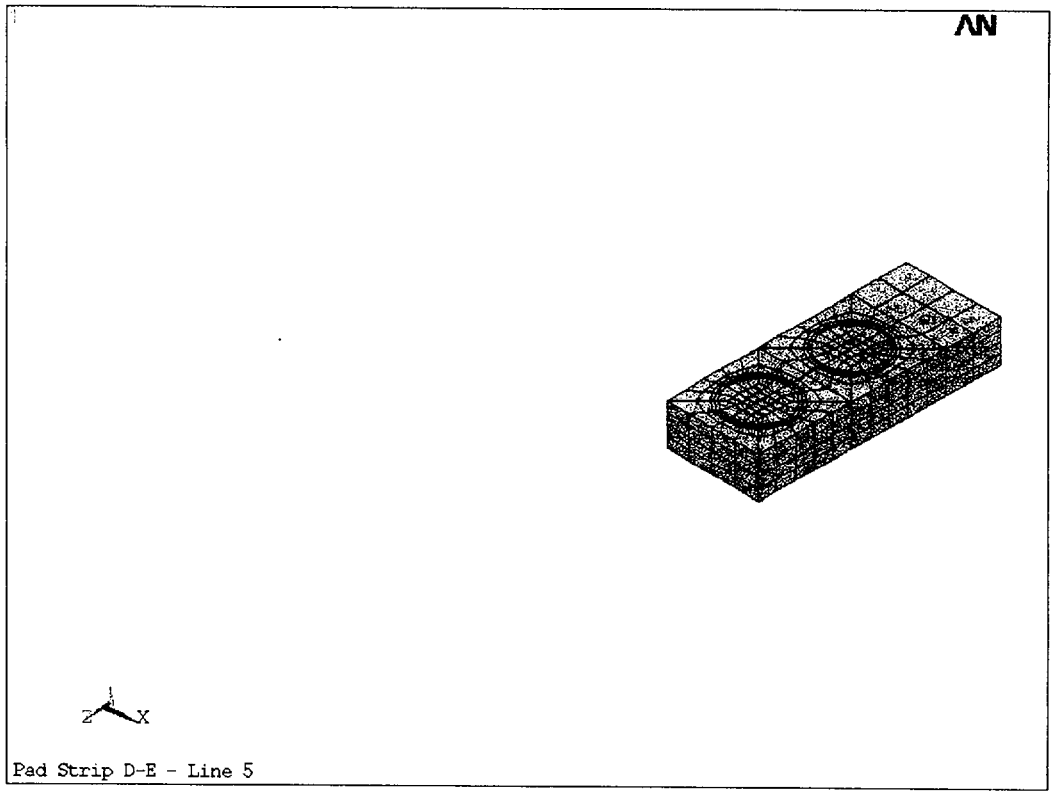


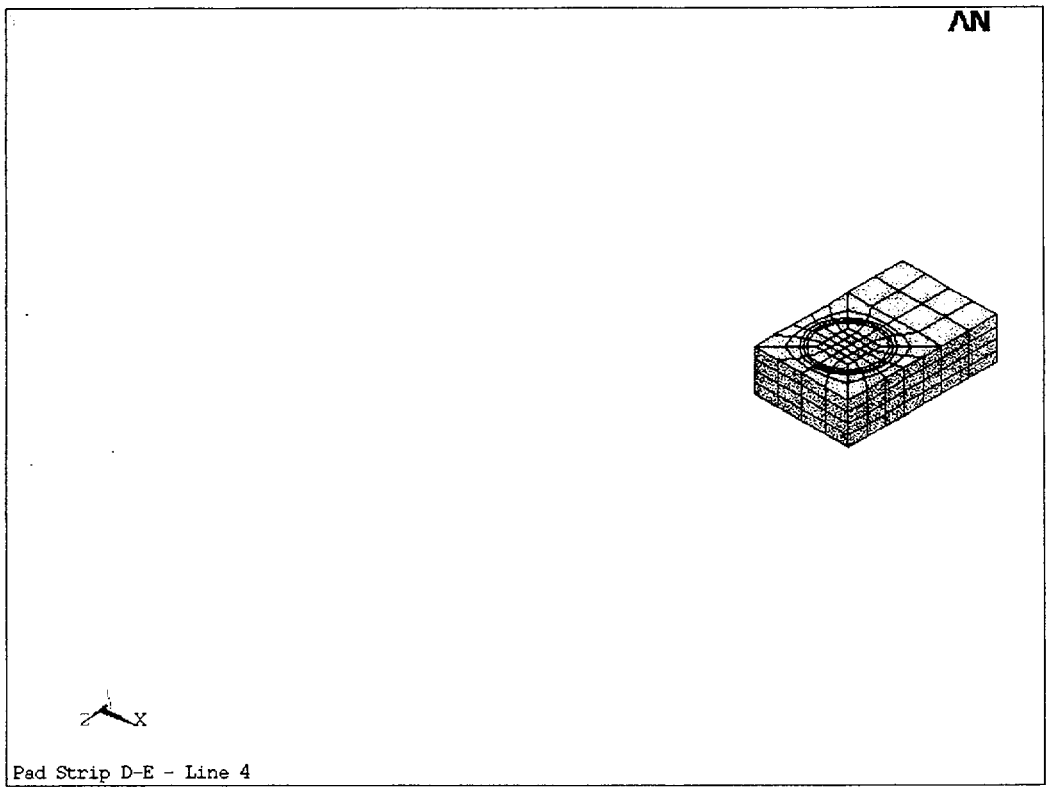
Pad Strip D-E - Line 8



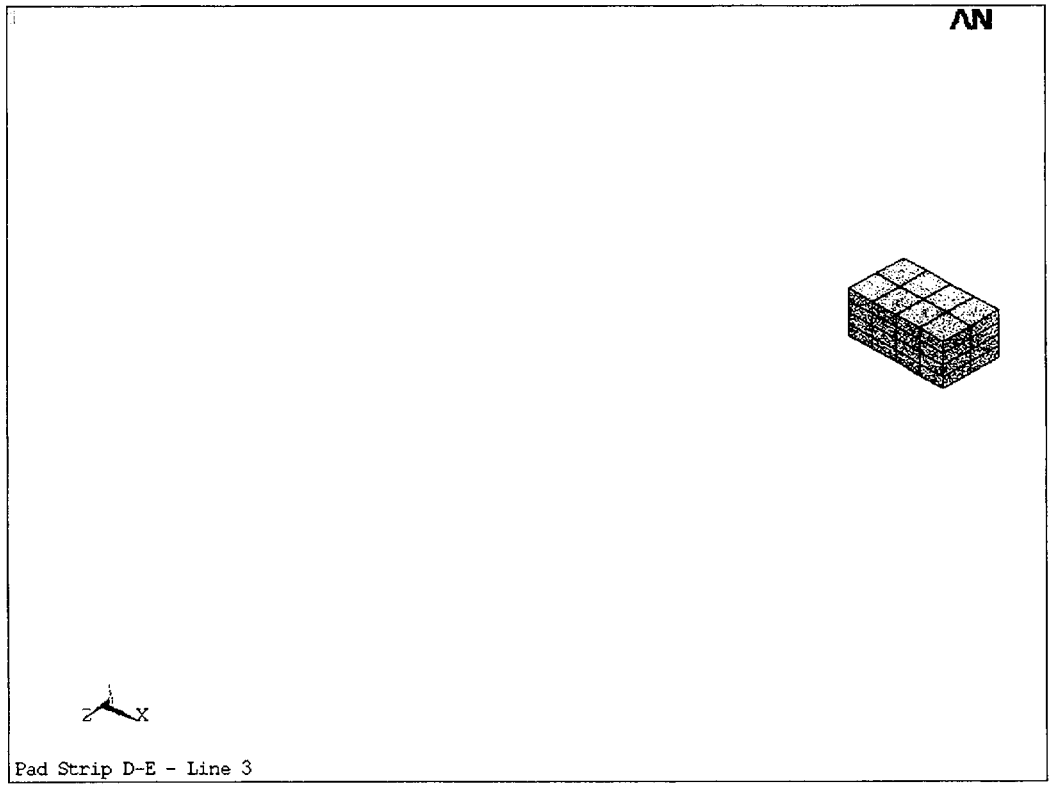
Pad Strip D-E - Line 7


AN
Z
X
Pad Strip D-E - Line 6

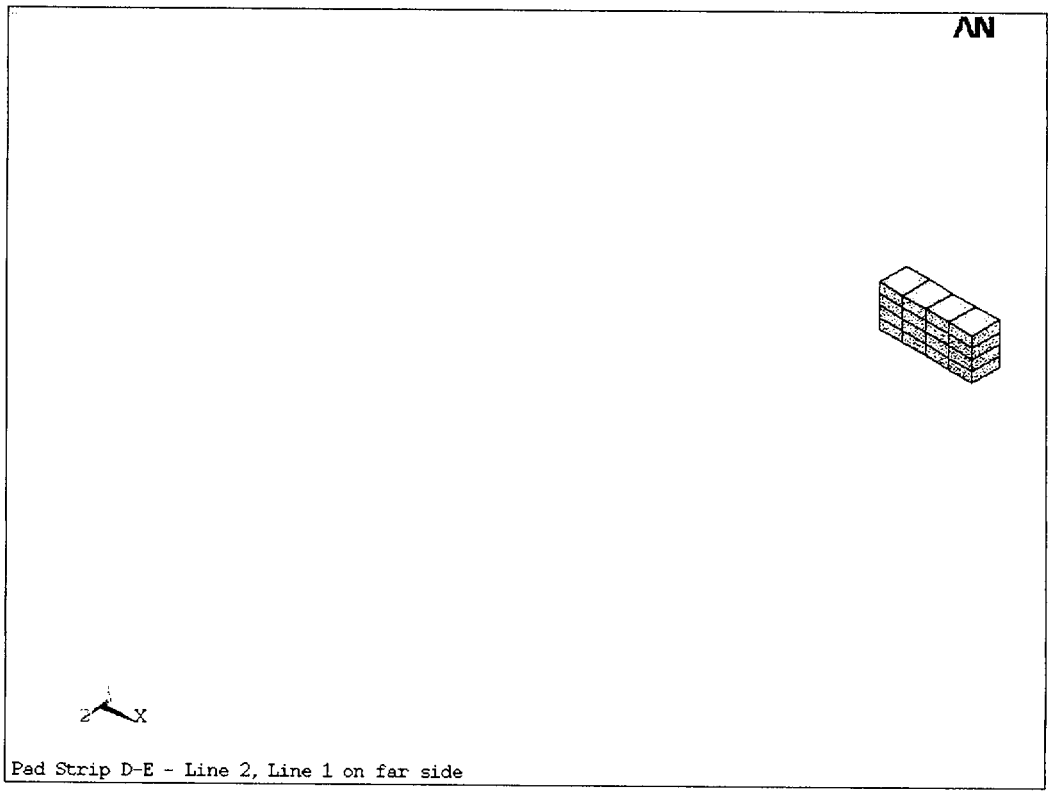

AN
Z
X
Pad Strip D-E - Line 5

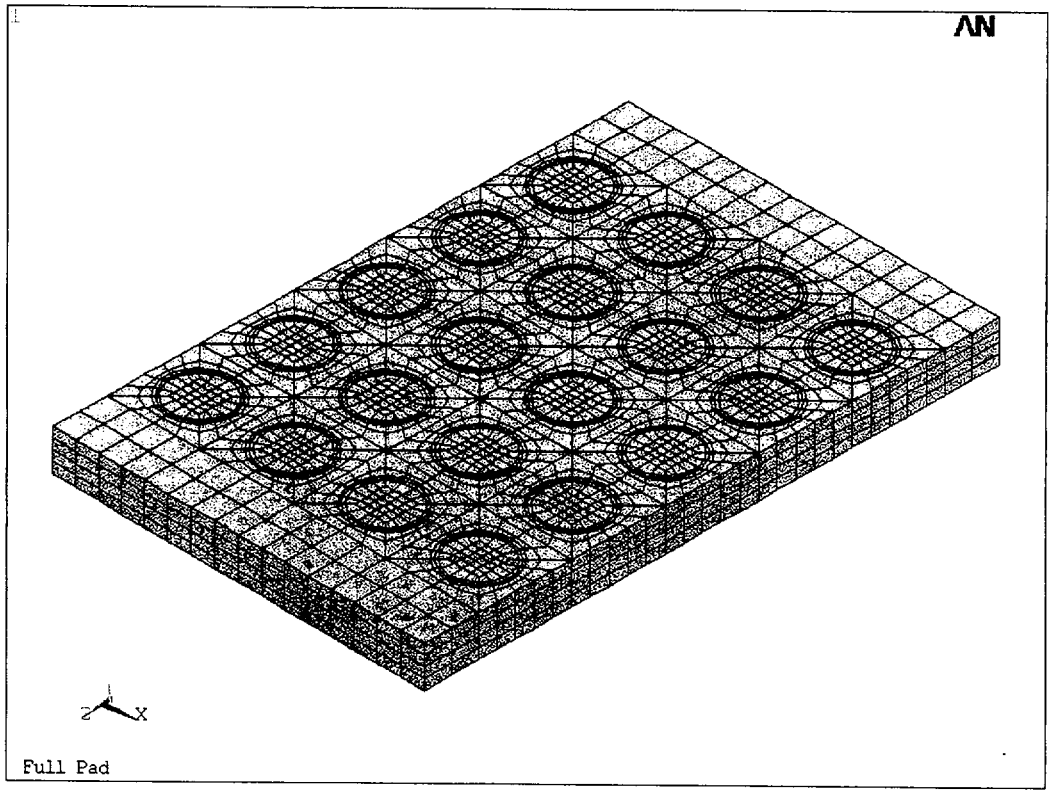


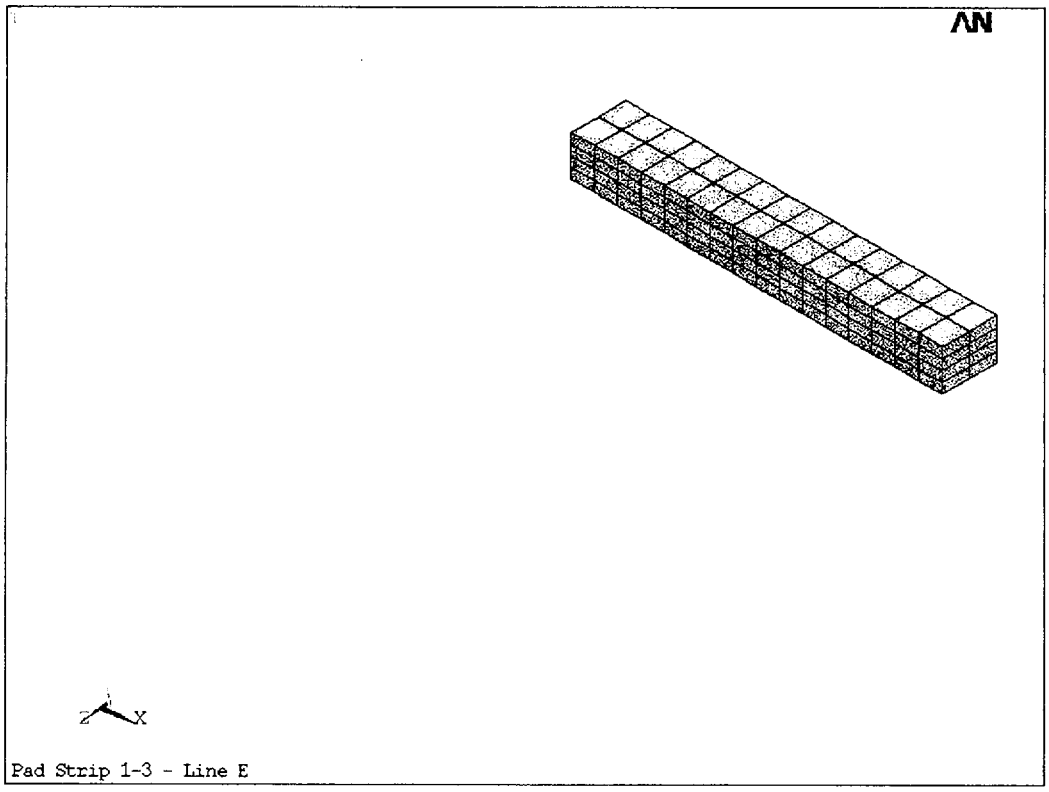
Pad Strip D-E - Line 4



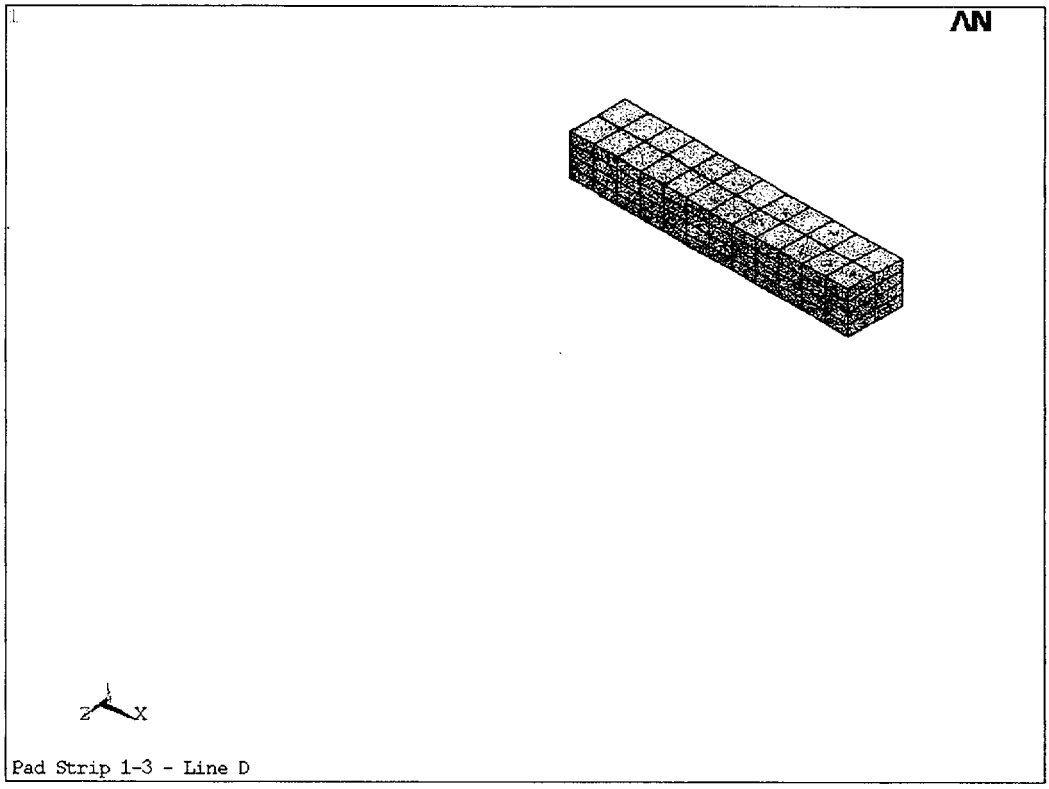
Pad Strip D-E - Line 3


AN
Z
X
Pad Strip D-E - Line 2, Line 1 on far side

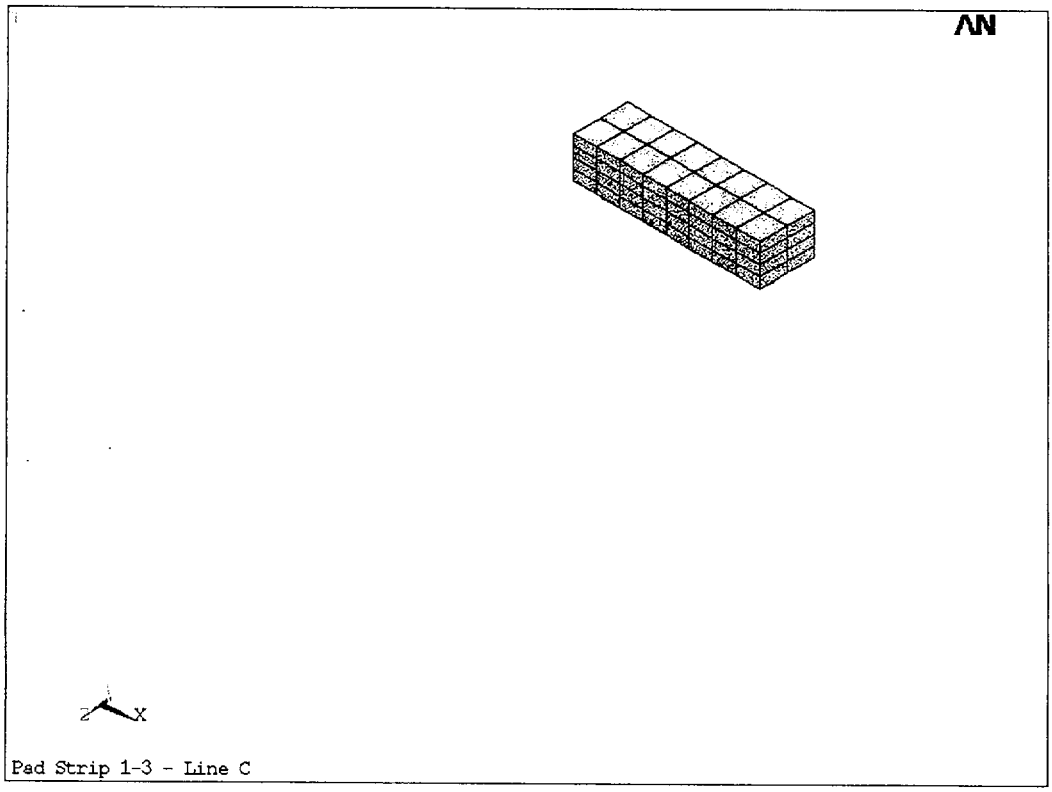

AN
Z
X
Full Pad



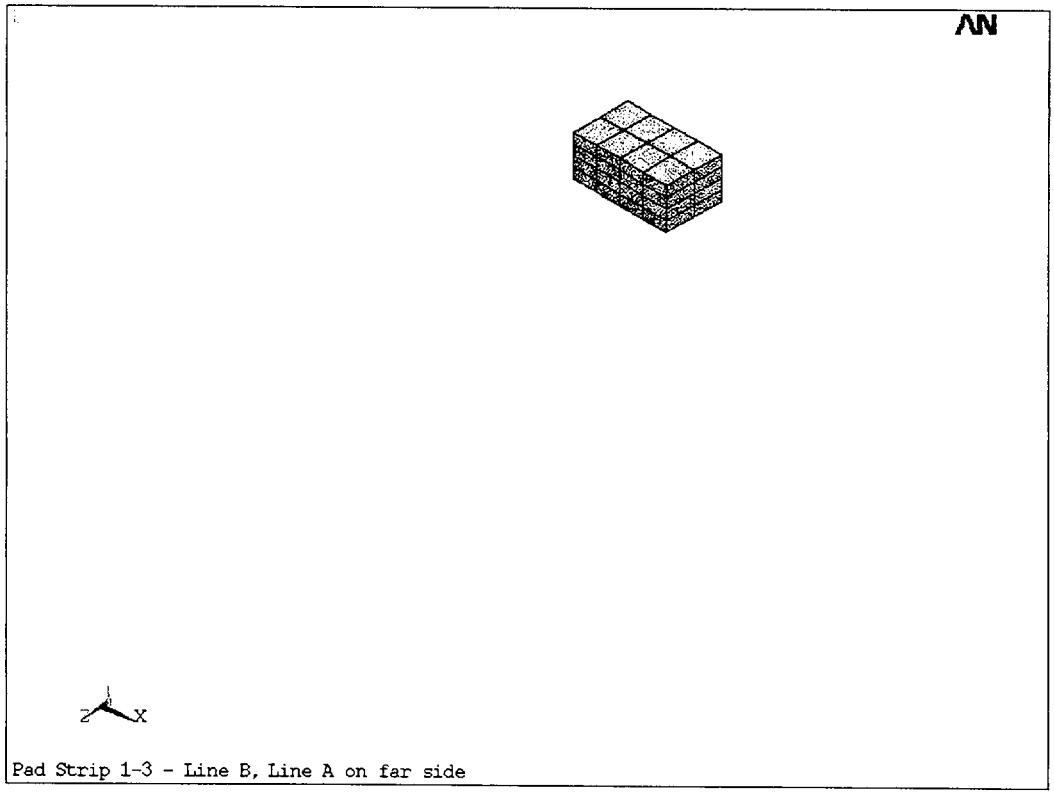
Pad Strip 1-3 - Line E



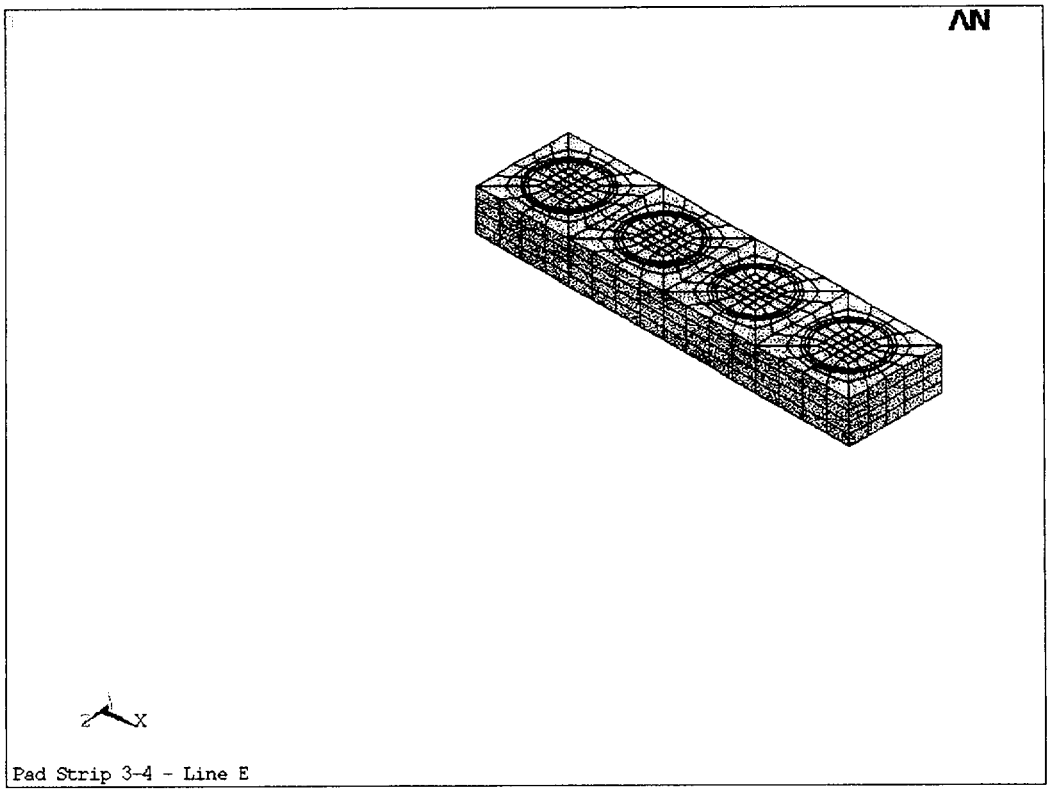
Pad Strip 1-3 - Line D



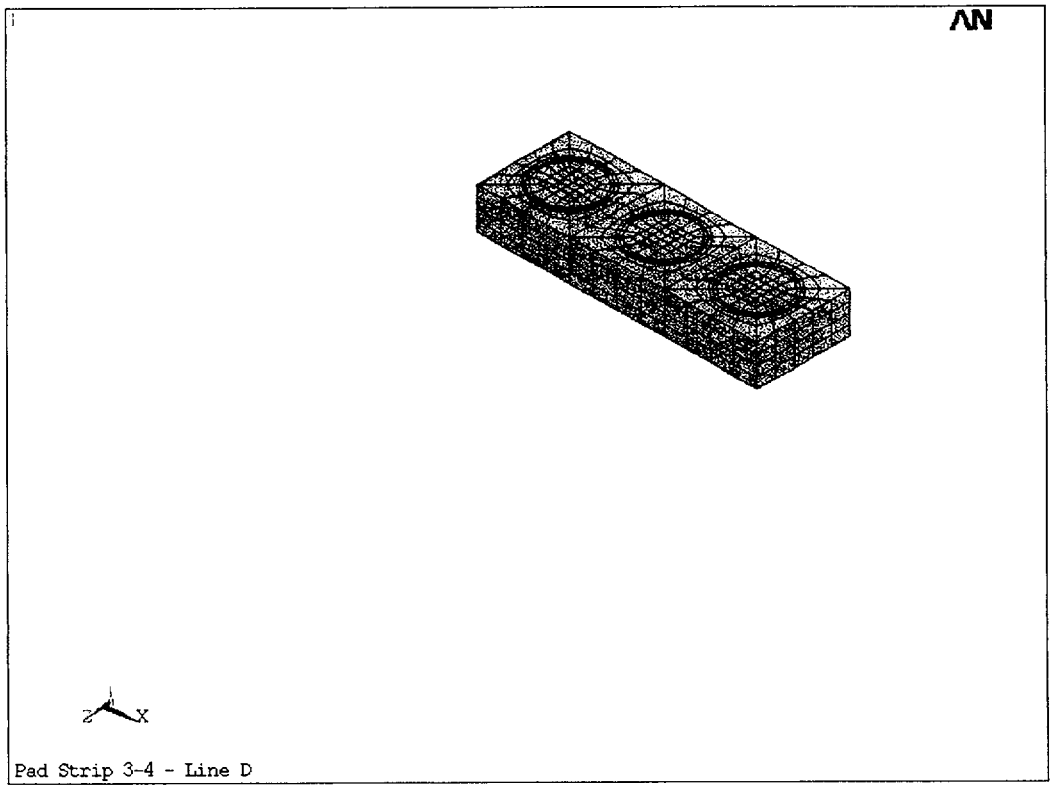
Pad Strip 1-3 - Line C



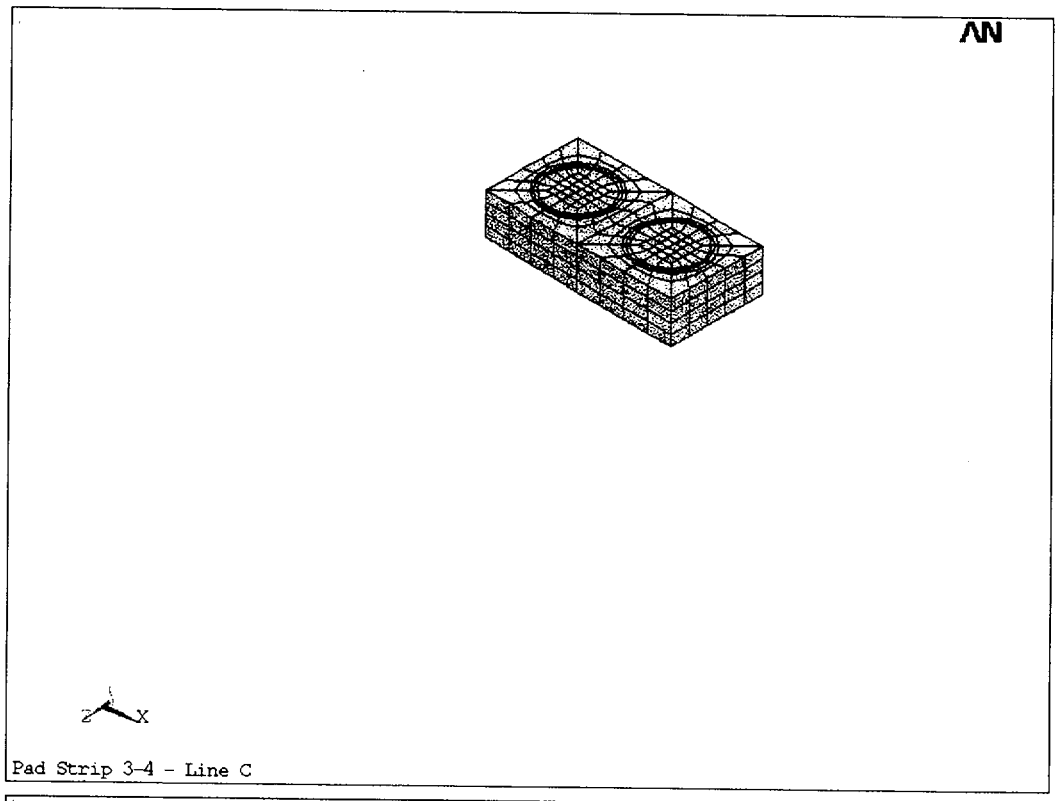
Pad Strip 1-3 - Line B, Line A on far side



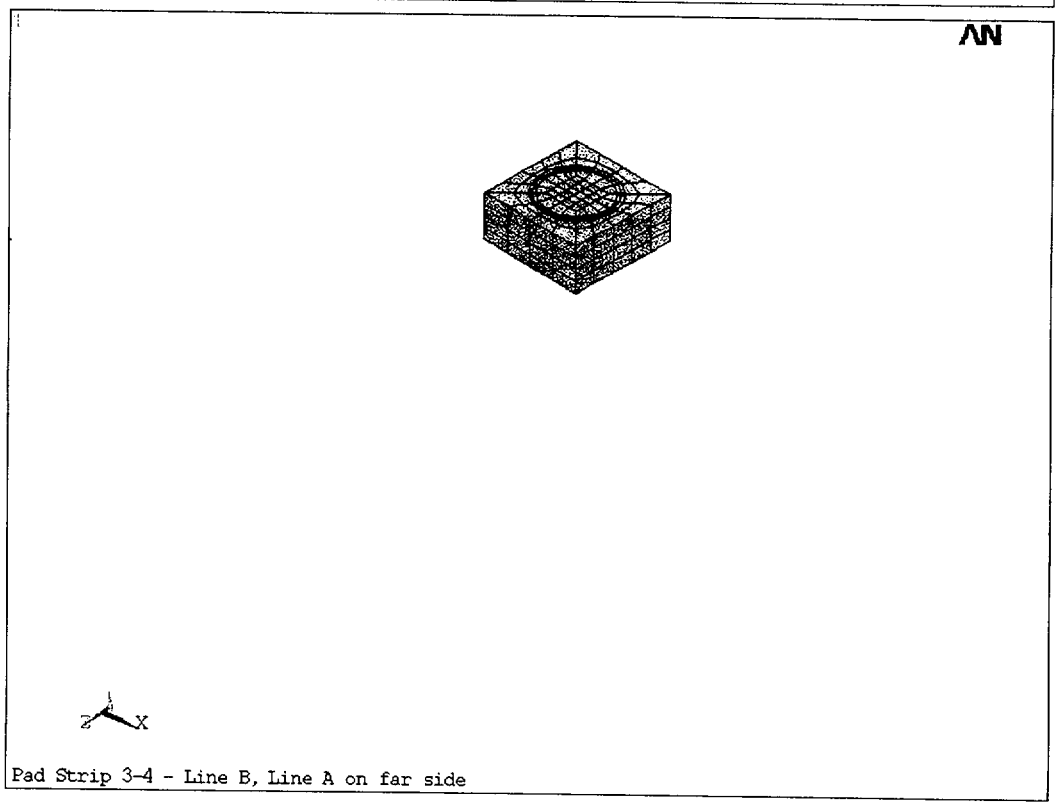
Pad Strip 3-4 - Line E



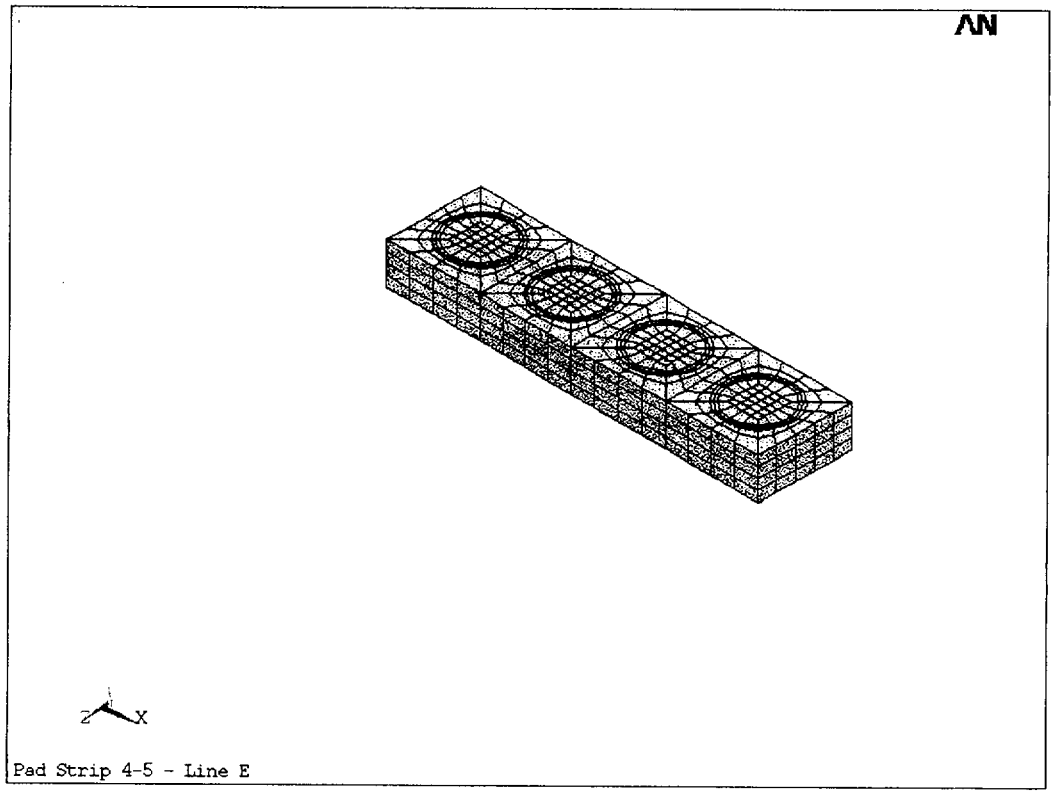
Pad Strip 3-4 - Line D

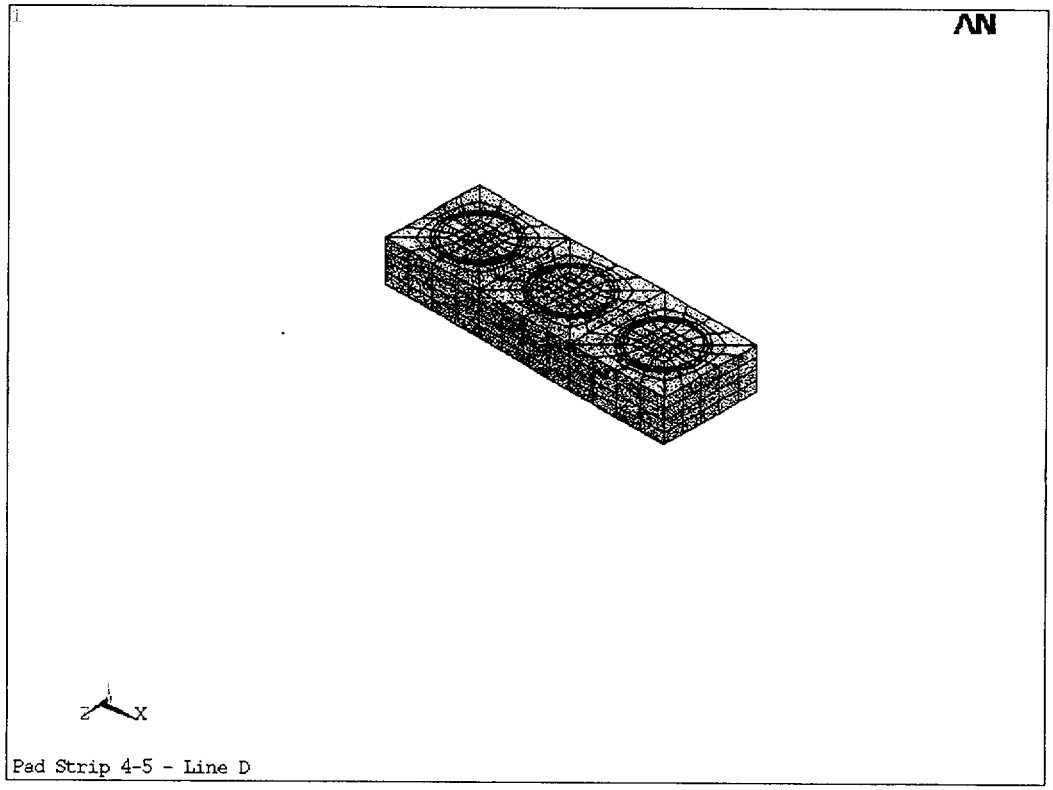


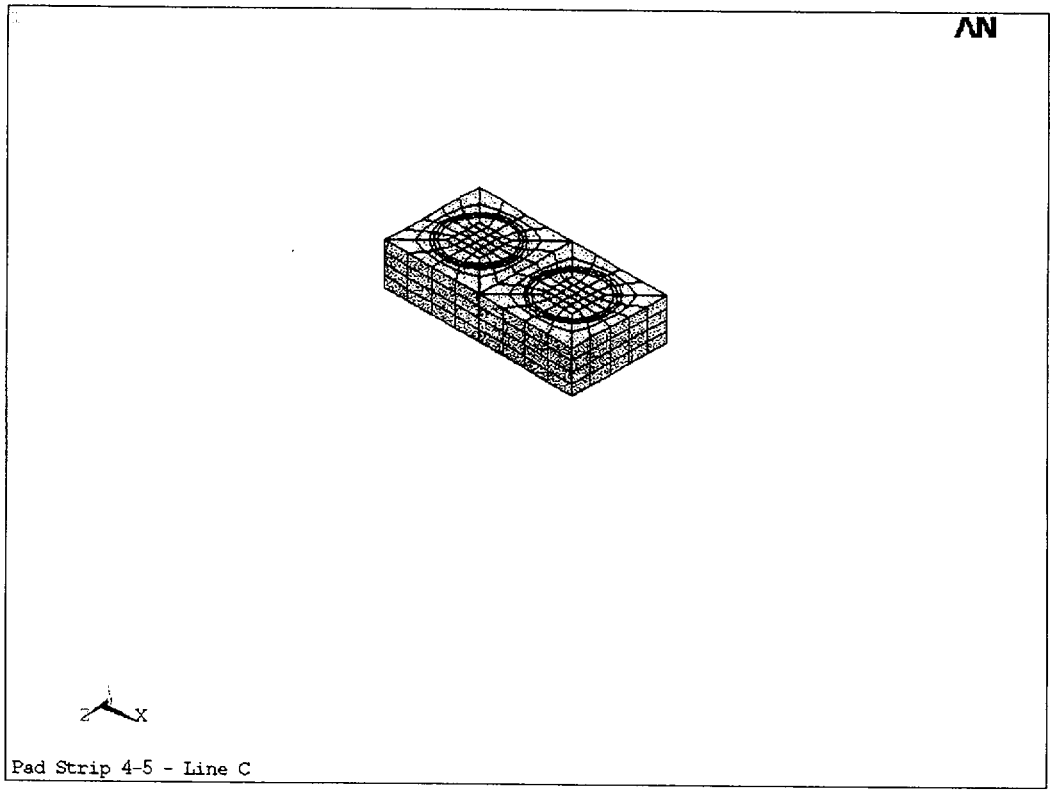
Pad Strip 3-4 - Line C



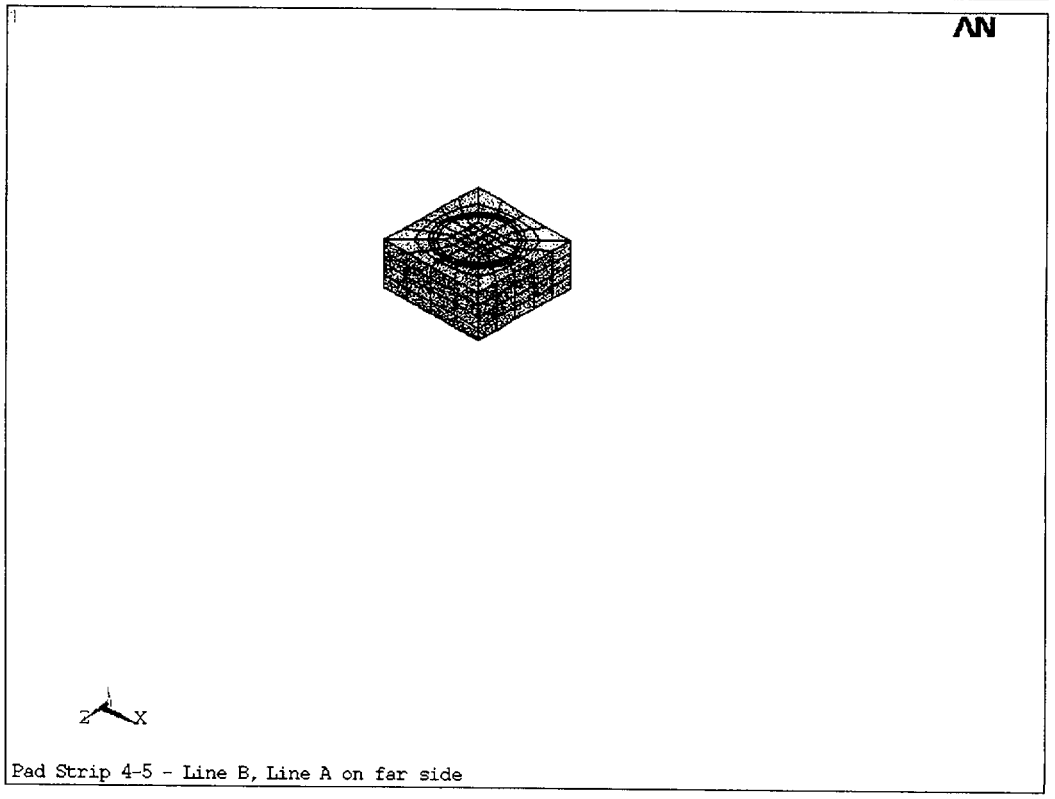
Pad Strip 3-4 - Line B, Line A on far side


AN
Z
X
Pad Strip 4-5 - Line E

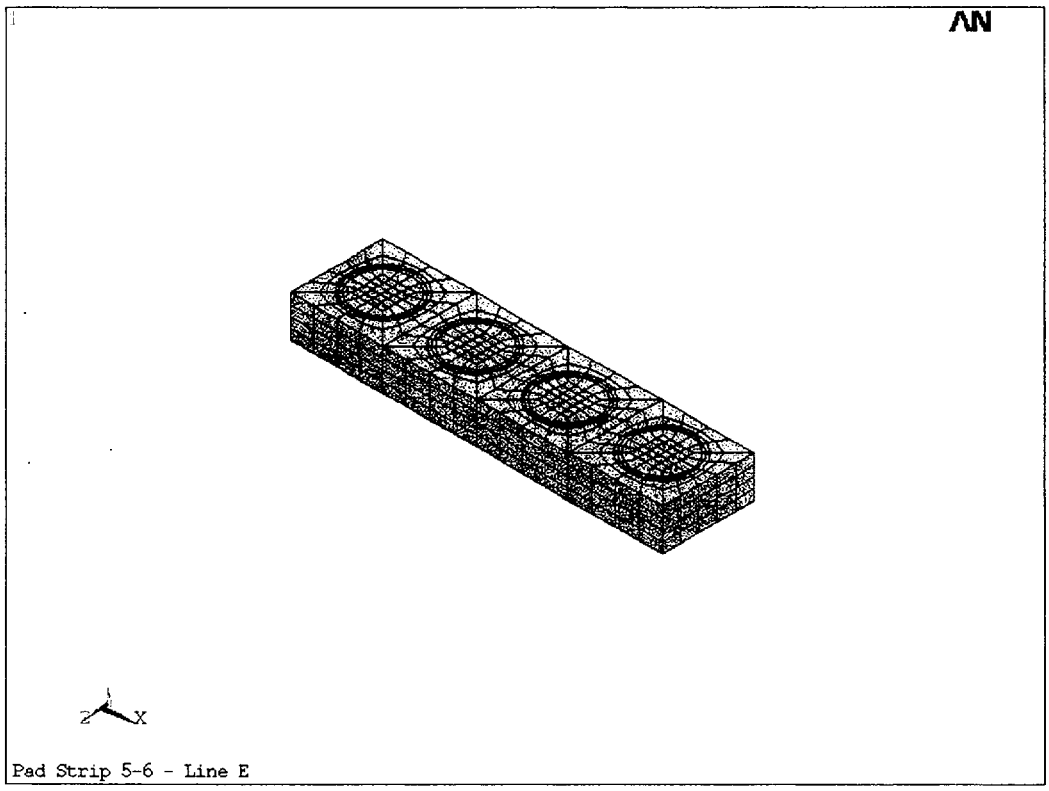

AN
Z
X
Pad Strip 4-5 - Line D



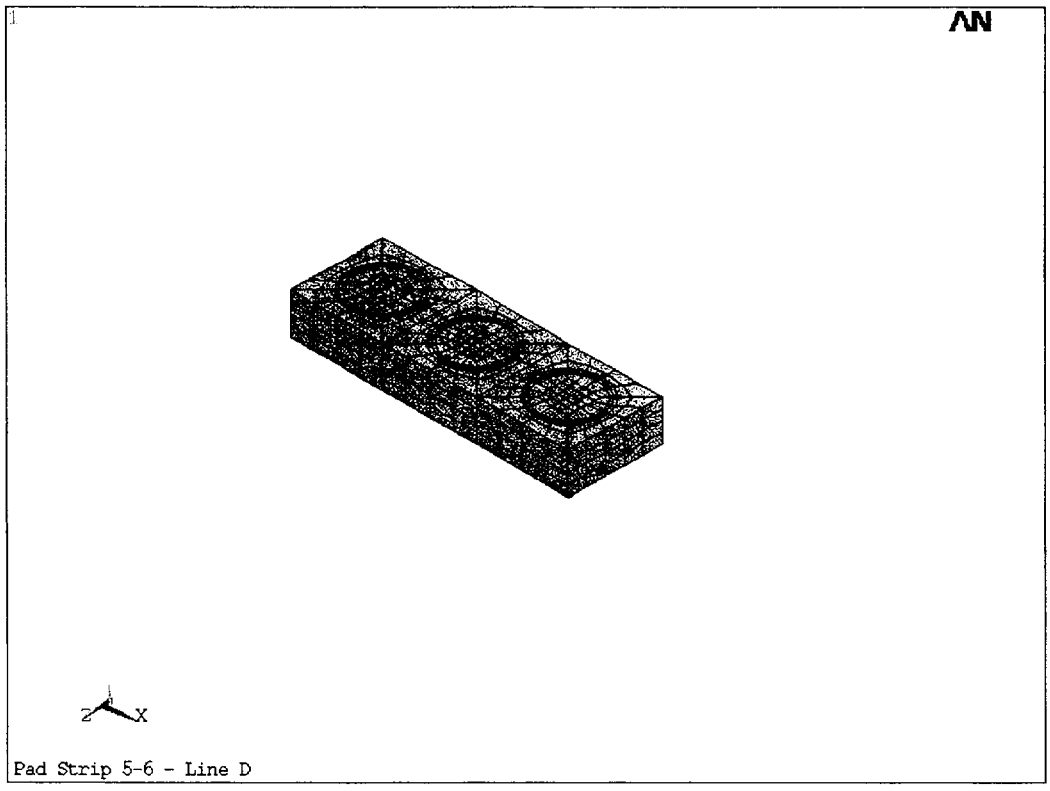
Pad Strip 4-5 - Line C



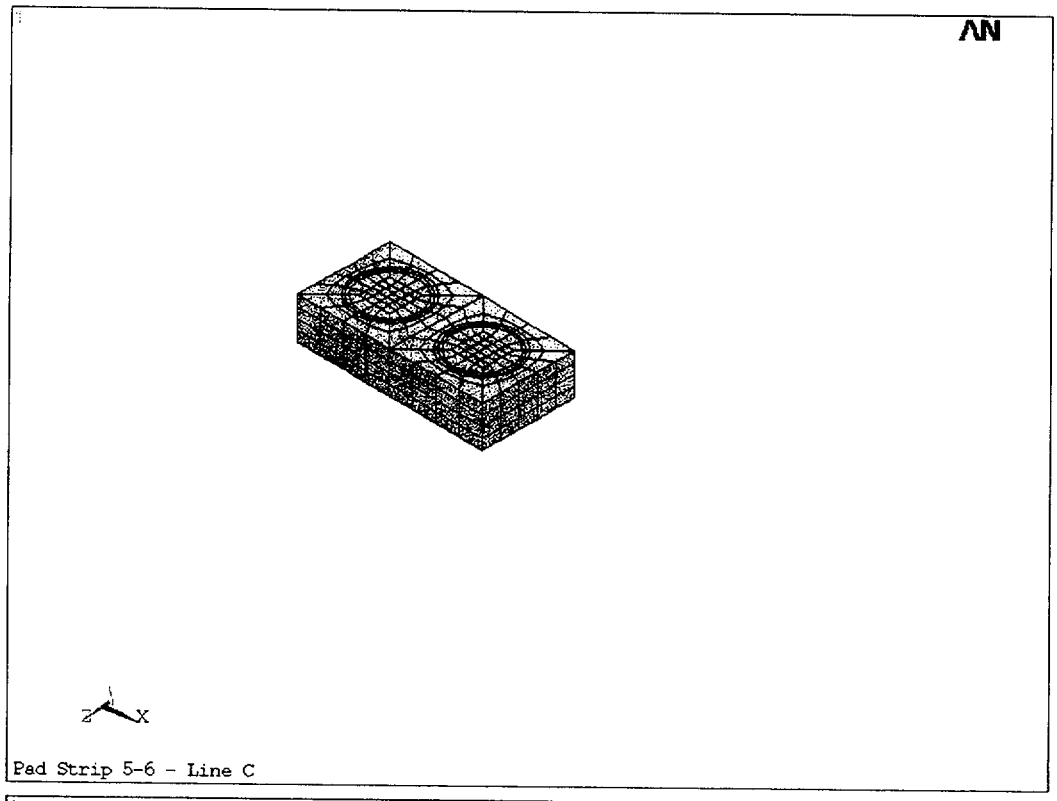
Pad Strip 4-5 - Line B, Line A on far side



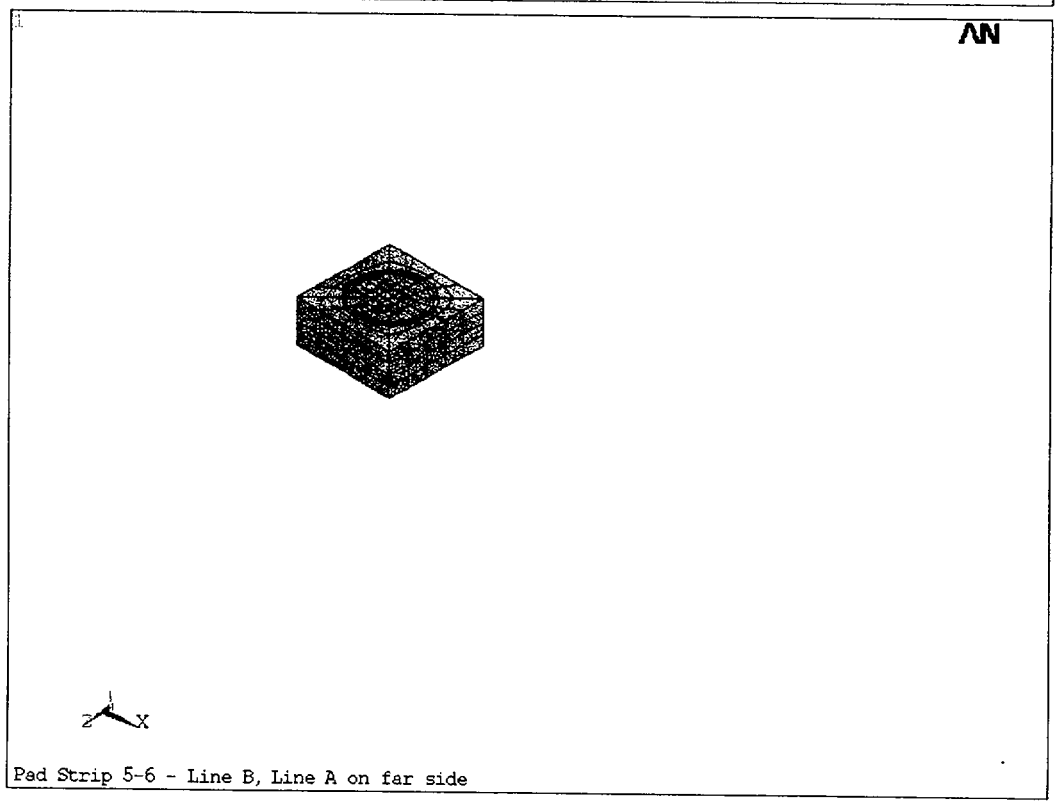
Pad Strip 5-6 - Line E



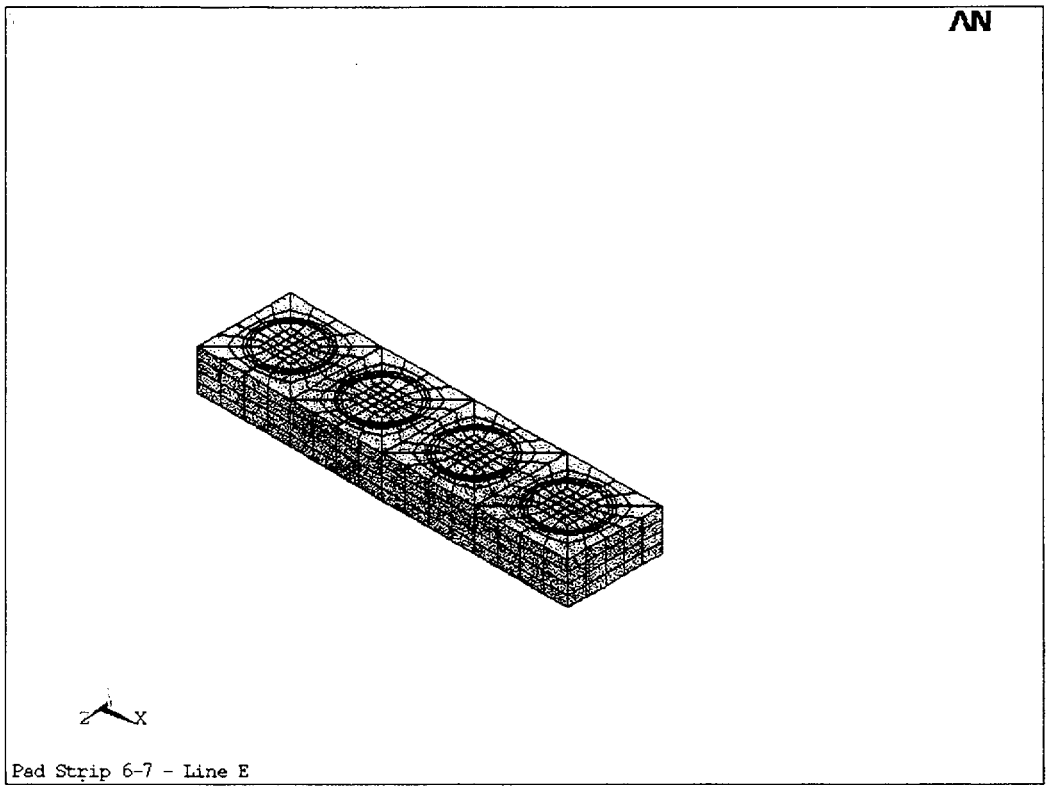
Pad Strip 5-6 - Line D



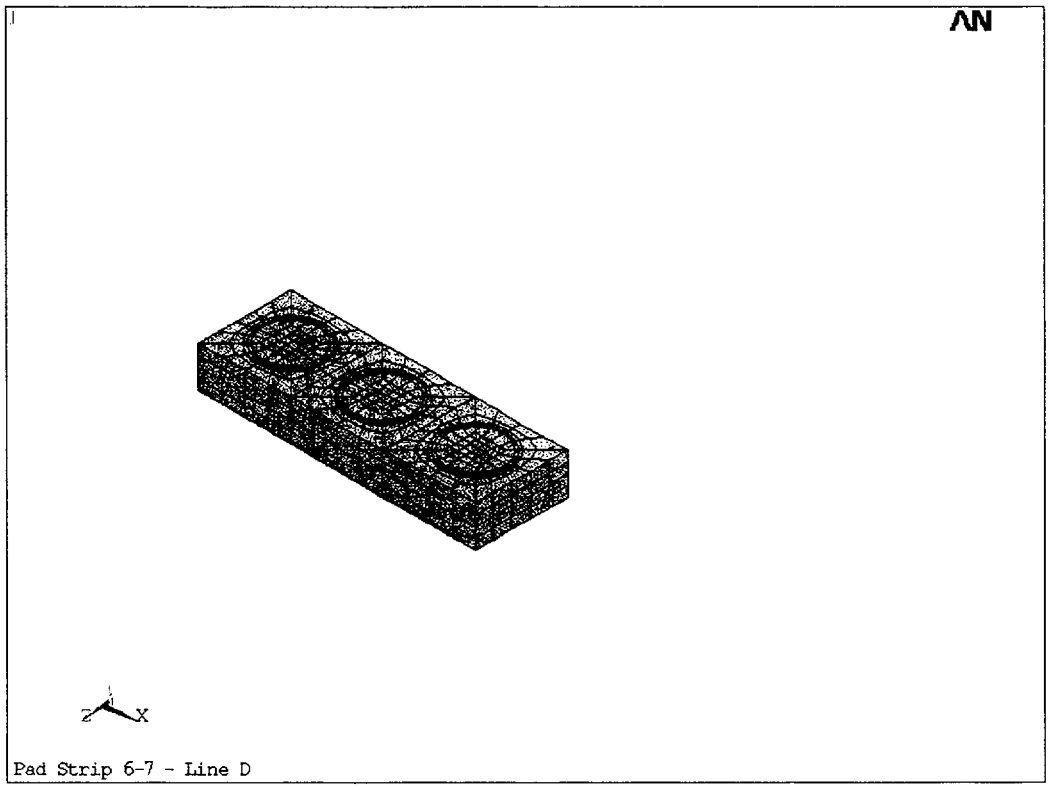
Pad Strip 5-6 - Line C



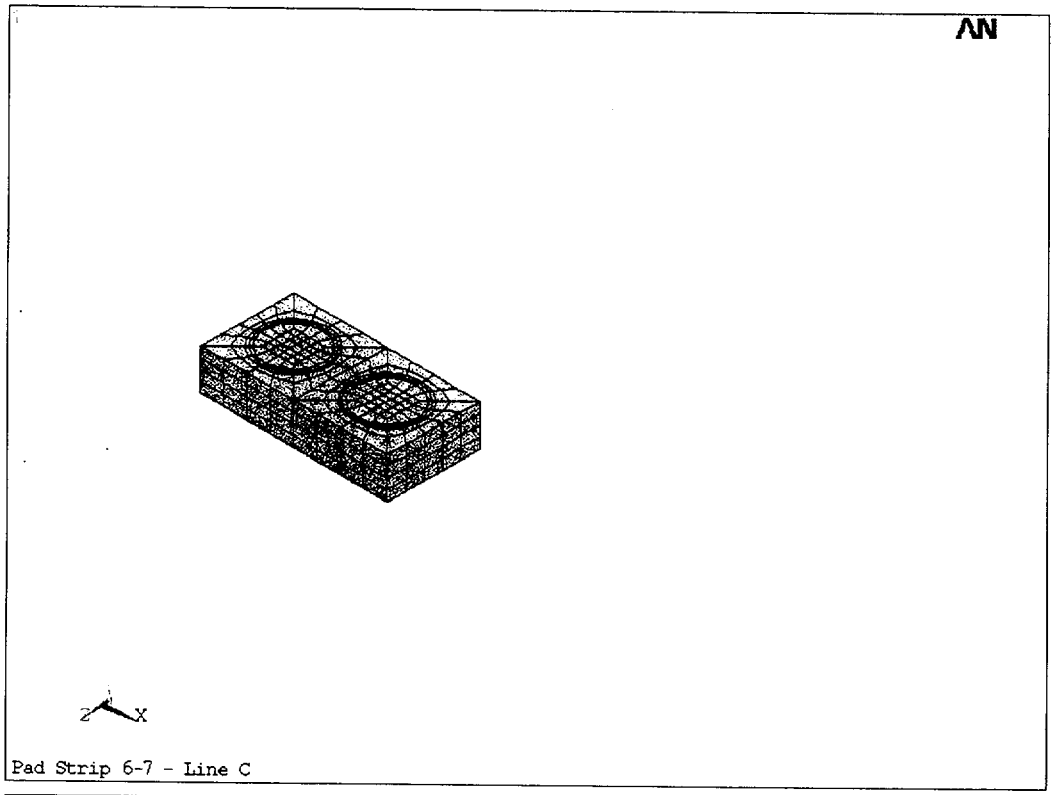
Pad Strip 5-6 - Line B, Line A on far side



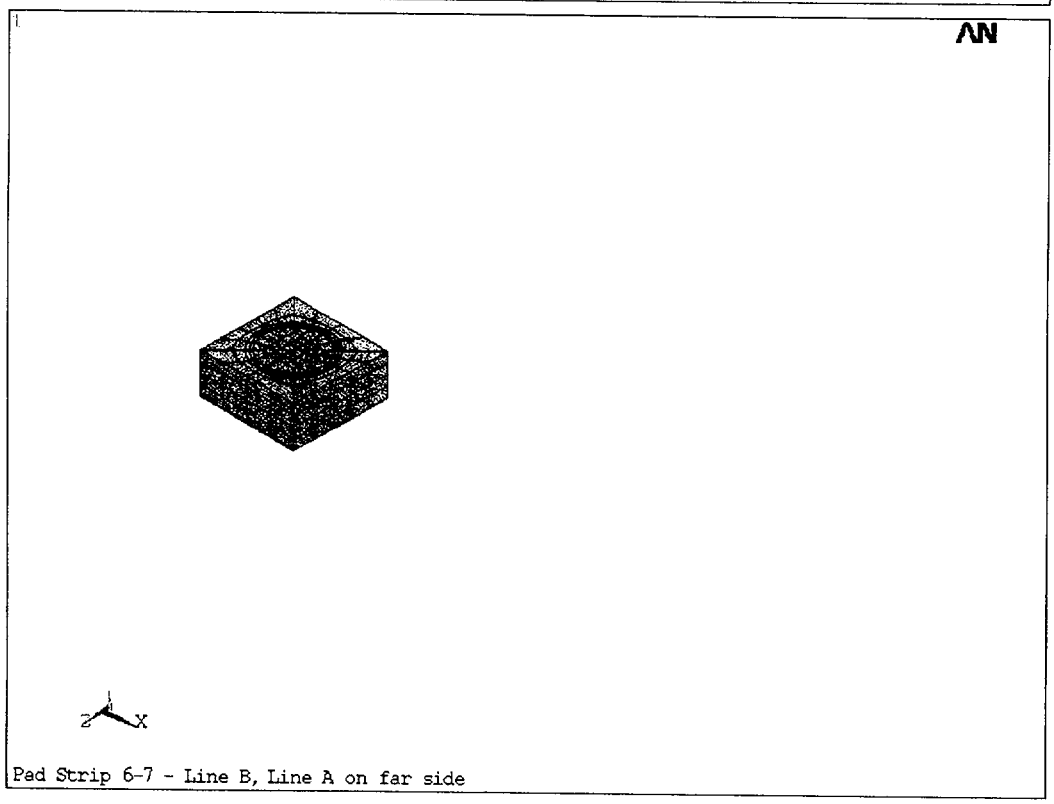
Pad Strip 6-7 - Line E



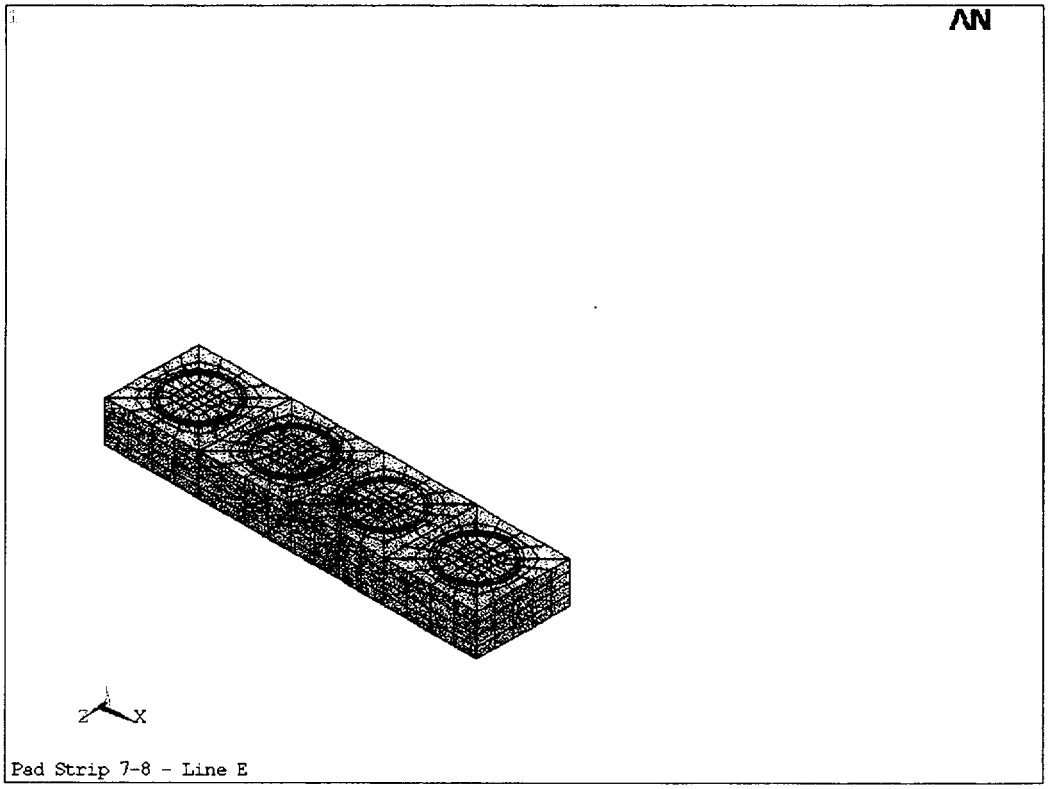
Pad Strip 6-7 - Line D

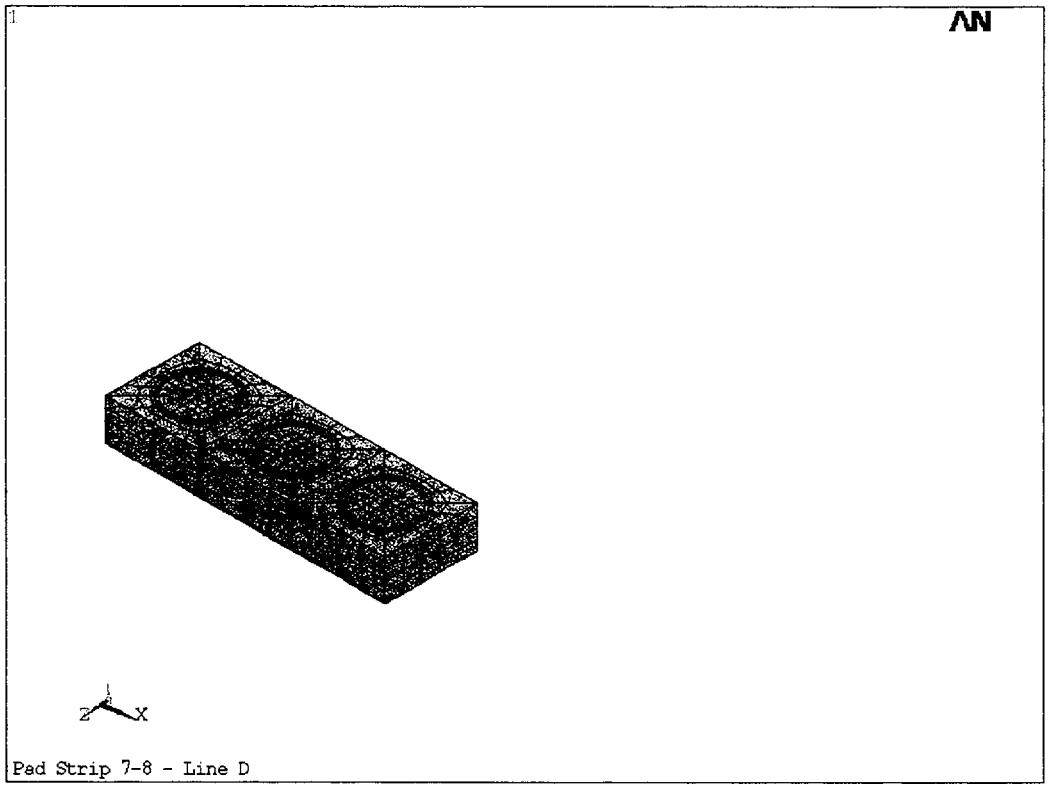


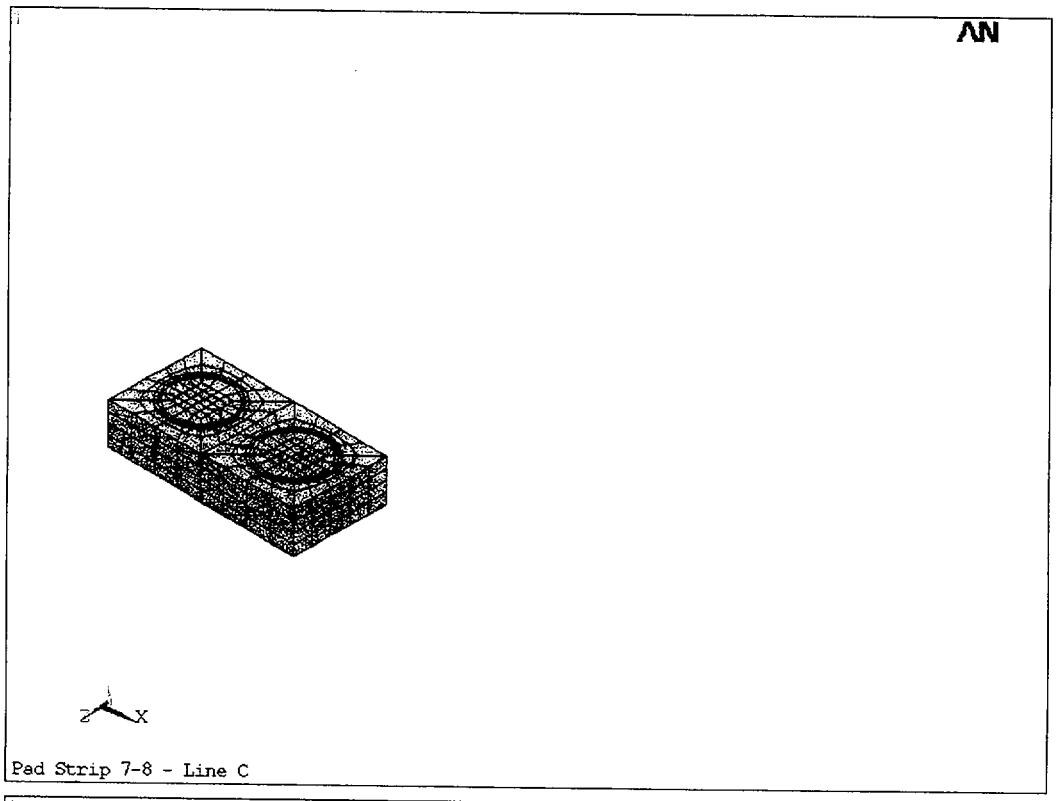
Pad Strip 6-7 - Line C



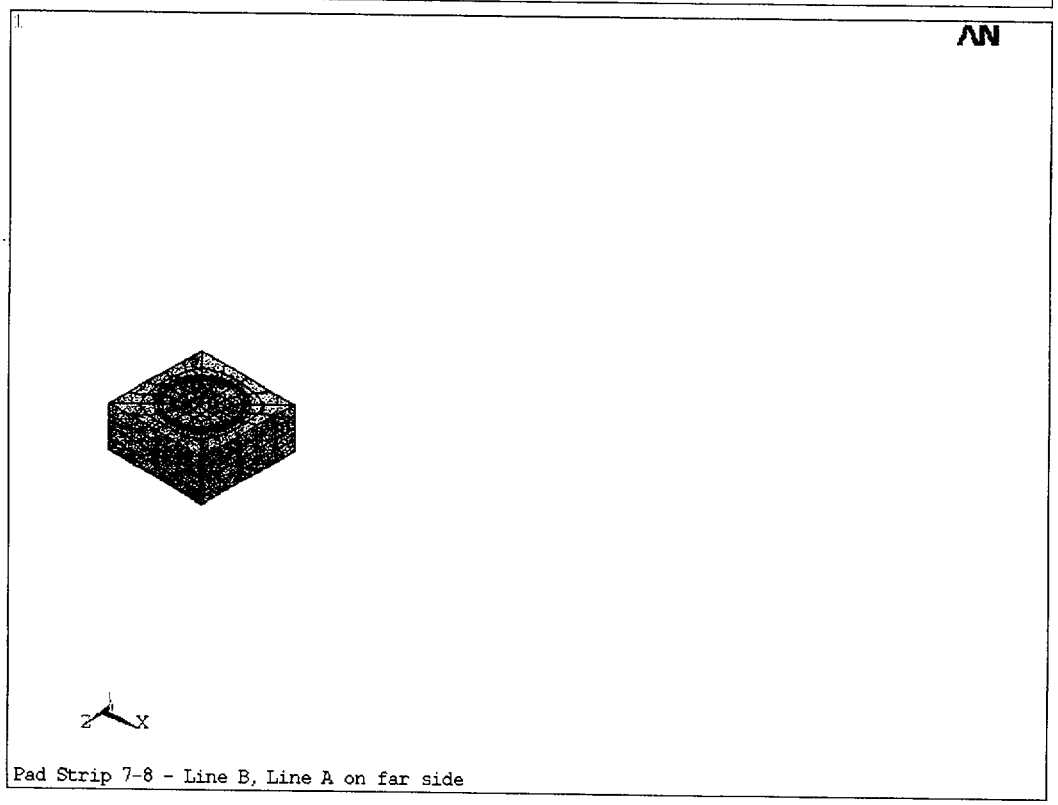
Pad Strip 6-7 - Line B, Line A on far side


1
AN
Z
X
Pad Strip 7-8 - Line E

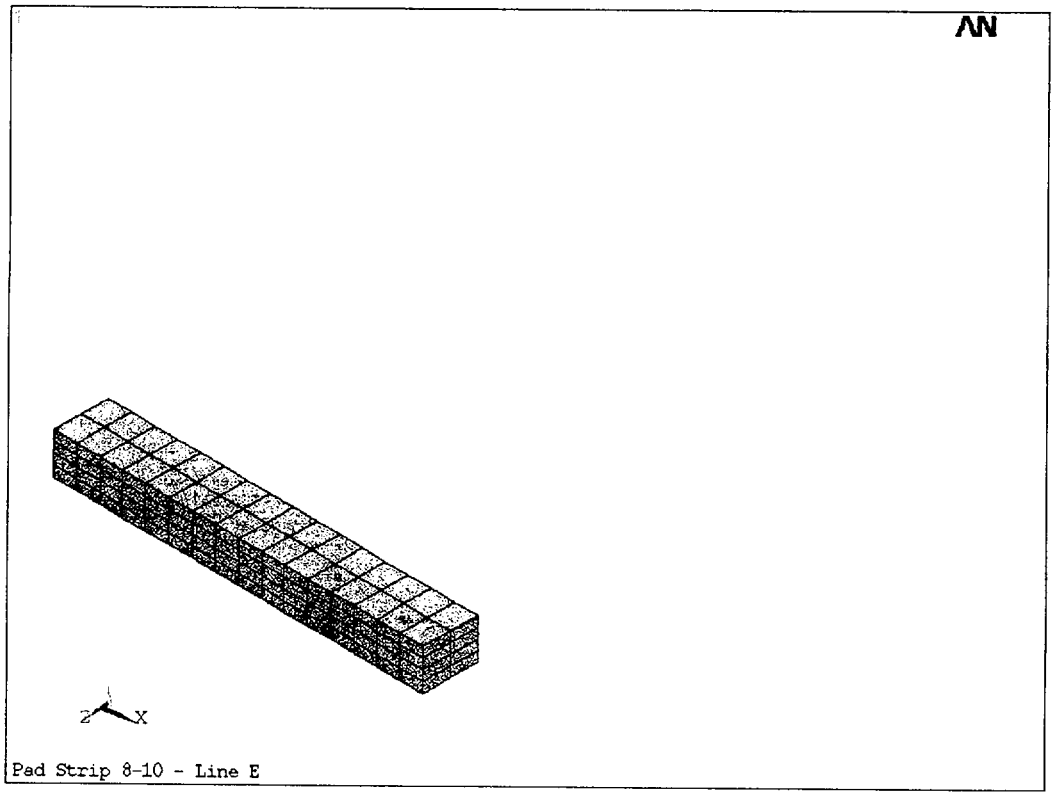

1
AN
Z
X
Pad Strip 7-8 - Line D



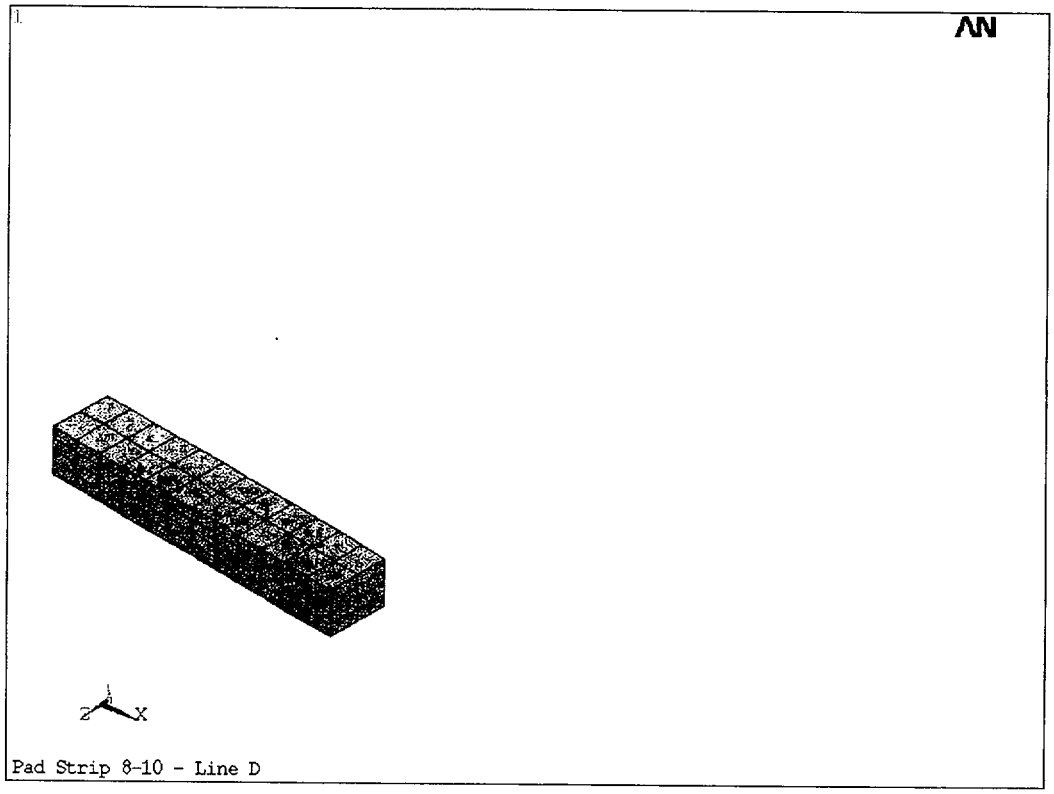
Pad Strip 7-8 - Line C



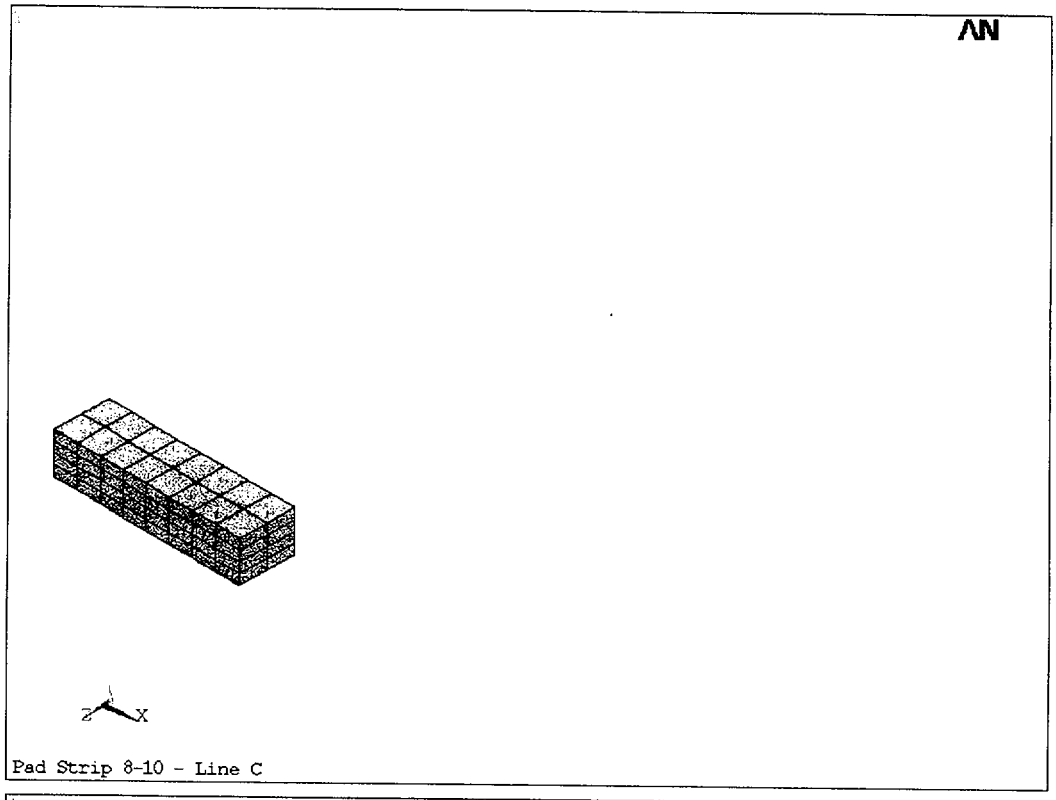
Pad Strip 7-8 - Line B, Line A on far side



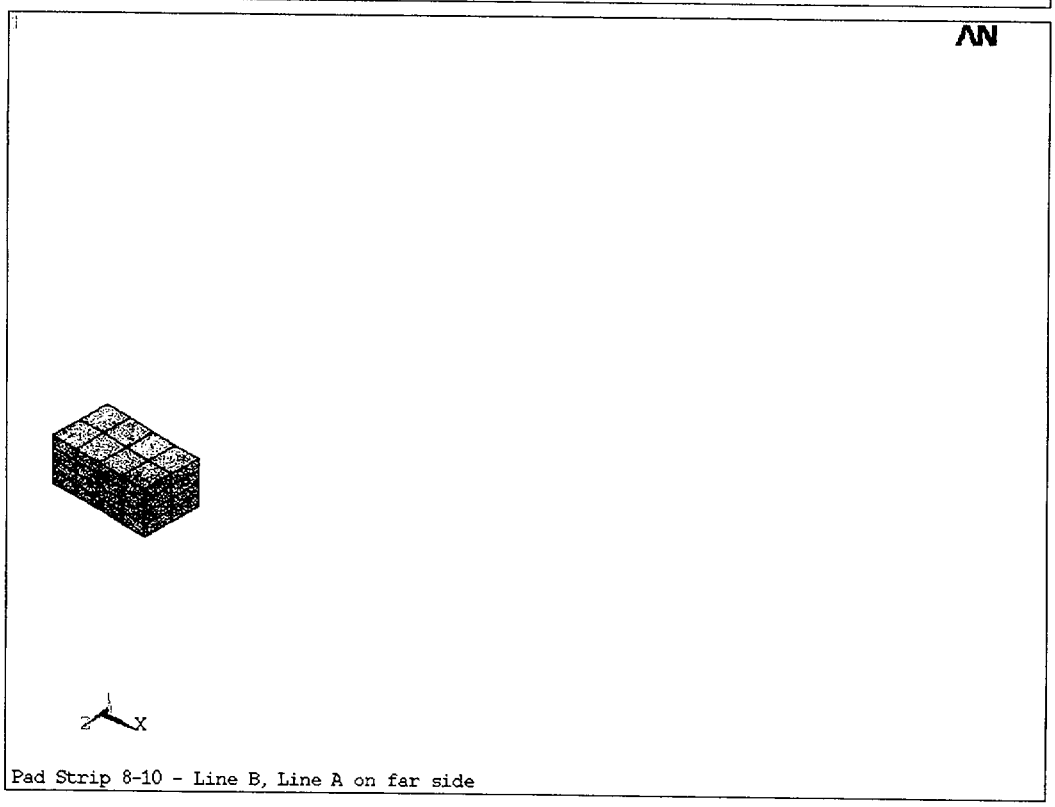
Pad Strip 8-10 - Line E



Pad Strip 8-10 - Line D



Pad Strip 8-10 - Line C



Pad Strip 8-10 - Line B, Line A on far side

The following ANSYS file was used to create the plots:

```
/com,
/COM  This is the load results processor modified to make
/com  plots of the strips.
/com
/com, This routine processes load results data for the
/com,   evaluation of pad internal forces and moments
/com
/com,   Soft Rock Load Step Results
/com
/com
/com ***************************************************************************
/com ***************************************************************************
/com ***************************************************************************
/com ***************************************************************************
/com ***************************************************************************
/com ***************************************************************************
/com
/com ************************* Soft Rock Results ******************************
/com
/file,dcslabs2
resume
/HEADER,ON,OFF,OFF,OFF,ON,OFF
/post1
/show,jpeg
eall
nall
/RGB,INDEX,100,100,100, 0
/RGB,INDEX, 80, 80, 80,13
/RGB,INDEX, 60, 60, 60,14
/RGB,INDEX,  0,  0,  0,15
eplo
/com
/com ***************************************************************************
/com ***************************************************************************
/com *************************  LOAD CASE 2 ***********************************
set,2
/COM
/COM  SECTION THE PAD IN TO 4 NORTH-SOUTH Z-DIRECTION STRIPS
/com
/com  Select all nodes in pad only
/com
esel,type,1
nelem
/title, Full Pad
eplo
/dist,,user
/focus,,user
/com
/com  select strip Z direction x = -102 to 102 Lines A to B
/com
nsel,r,loc,x,-102.1,102.1
enode,1
/title,Pad Strip A-B - Line 10
eplo
```

```
/com
/com  internal forces at Z = 222.0  LINE 10
/com
nsel,r,loc,z,221.9,222.1
spoint,,0,-45.0,222.0
fsum
nelem
/com
/com  internal forces at Z = 162.0  LINE 9
/com
nsel,r,loc,z,-1038.1,162.1
enode,1
/title,Pad Strip A-B - Line 9
eplo
nsel,r,loc,z,161.9,162.1
spoint,,0,-45.0,162.0
fsum
nelem
/com
/com  internal forces at Z = 102.0  LINE 8
/com
nsel,r,loc,z,-1038.1,102.1
enode,1
/title,Pad Strip A-B - Line 8
eplo
nsel,r,loc,z,101.9,102.1
spoint,,0,-45.0,102.0
fsum
nelem
/com
/com  internal forces at Z = -102.0 LINE 7
/com
nsel,r,loc,z,-1038.1,-101.9
enode,1
/title,Pad Strip A-B - Line 7
eplo
nsel,r,loc,z,-101.9,-102.1
spoint,,0,-45.0,-102.0
fsum
nelem
/com
/com  internal forces at Z = -306.0 LINE 6
/com
nsel,r,loc,z,-1038.1,-305.9
enode,1
/title,Pad Strip A-B - Line 6
eplo
nsel,r,loc,z,-305.9,-306.1
spoint,,0,-45.0,-306.0
fsum
nelem
/com
/com  internal forces at Z = -510.0 LINE 5
/com
nsel,r,loc,z,-1038.1,-509.9
enode,1
/title,Pad Strip A-B - Line 5
```

```
eplo
nsel,r,loc,z,-509.9,-510.1
spoint,,0,-45.0,-510.0
fsum
nelem
/com
/com  internal forces at Z = -714.0 LINE 4
/com
nsel,r,loc,z,-1038.1,-713.9
enode,1
/title,Pad Strip A-B - Line 4
eplo
nsel,r,loc,z,-713.9,-714.1
spoint,,0,-45.0,-714.0
fsum
nelem
/com
/com  internal forces at Z = -918.0 LINE 3
/com
nsel,r,loc,z,-1038.1,-917.9
enode,1
/title,Pad Strip A-B - Line 3
eplo
nsel,r,loc,z,-917.9,-918.1
spoint,,0,-45.0,-918.0
fsum
nelem
/com
/com  internal forces at Z = -978.0 LINE 2
/com
nsel,r,loc,z,-1038.1,-977.9
enode,1
/title,Pad Strip A-B - Line 2, Line 1 on far side
eplo
nsel,r,loc,z,-977.9,-978.1
spoint,,0,-45.0,-978.0
fsum
nelem
/com
/com  internal forces at Z = -1038.0      LINE 1
/com
nsel,r,loc,z,-1037.9,-1038.1
spoint,,0,-45.0,-1038.0
fsum
/com  next strip x = 102 to 306 Lines B to C
/com
/com  Select all nodes in pad only
/com
esel,type,1
nelem
eplo
/com
/com  select strip Z direction
/com
nsel,r,loc,x,101.9,306.1
enode,1
/title,Pad Strip B-C - Line 10
```

```
eplo
/com
/com  internal forces at Z = 222.0  LINE 10
/com
nsel,r,loc,z,221.9,222.1
spoint,,204.0,-45.0,222.0
fsum
nelem
/com
/com  internal forces at Z = 162.0  LINE 9
/com
nsel,r,loc,z,-1038.1,162.1
enode,1
/title,Pad Strip B-C - Line 9
/com
eplo
nsel,r,loc,z,161.9,162.1
spoint,,204.0,-45.0,162.0
fsum
nelem
/com
/com  internal forces at Z = 102.0  LINE 8
/com
nsel,r,loc,z,-1038.1,102.1
enode,1
/title,Pad Strip B-C - Line 8
eplo
nsel,r,loc,z,101.9,102.1
spoint,,204.0,-45.0,102.0
fsum
nelem
/com
/com  internal forces at Z = -102.0 LINE 7
/com
nsel,r,loc,z,-1038.1,-101.9
enode,1
/title,Pad Strip B-C - Line 7
eplo
nsel,r,loc,z,-101.9,-102.1
spoint,,204.0,-45.0,-102.0
fsum
nelem
/com
/com  internal forces at Z = -306.0 LINE 6
/com
nsel,r,loc,z,-1038.1,-305.9
enode,1
/title,Pad Strip B-C - Line 6
eplo
nsel,r,loc,z,-305.9,-306.1
spoint,,204.0,-45.0,-306.0
fsum
nelem
/com
/com  internal forces at Z = -510.0 LINE 5
/com
nsel,r,loc,z,-1038.1,-509.9
```

```
enode,1
/title,Pad Strip B-C - Line 5
eplo
nsel,r,loc,z,-509.9,-510.1
spoint,,204.0,-45.0,-510.0
fsum
nelem
/com
/com  internal forces at Z = -714.0 LINE 4
/com
nsel,r,loc,z,-1038.1,-713.9
enode,1
/title,Pad Strip B-C - Line 4
eplo
nsel,r,loc,z,-713.9,-714.0
spoint,,204.0,-45.0,-714.0
fsum
nelem
/com
/com  internal forces at Z = -918.0 LINE 3
/com
nsel,r,loc,z,-1038.1,-917.9
enode,1
/title,Pad Strip B-C - Line 3
eplo
nsel,r,loc,z,-917.9,-918.1
spoint,,204.0,-45.0,-918.0
fsum
nelem
/com
/com  internal forces at Z = -978.0 LINE 2
/com
nsel,r,loc,z,-1038.1,-977.9
enode,1
/title,Pad Strip B-C - Line 2, Line 1 on far side
eplo
nsel,r,loc,z,-977.9,-978.1
spoint,,204.0,-45.0,-978.0
fsum
nelem
/com
/com  internal forces at Z = -1038.0     LINE 1
/com
nsel,r,loc,z,-1037.9,-1038.1
spoint,,204.0,-45.0,-1038.0
fsum
/com  next strip x = 306 to 510 Lines C to D
/com
/com  Select all nodes in pad only
/com
esel,type,1
nelem
eplo
/com
/com  select strip Z direction
/com
nsel,r,loc,x,305.9,510.1
```

```
enode,1
/title,Pad Strip C-D - Line 10
eplo
/com
/com  internal forces at Z = 222.0  LINE 10
/com
nsel,r,loc,z,221.9,222.1
spoint,,408.0,-45.0,222.0
fsum
nelem
/com
/com  internal forces at Z = 162.0  LINE 9
/com
nsel,r,loc,z,-1038.1,162.1
enode,1
/title,Pad Strip C-D - Line 9
eplo
nsel,r,loc,z,161.9,162.1
spoint,,408.0,-45.0,162.0
fsum
nelem
/com
/com  internal forces at Z = 102.0  LINE 8
/com
nsel,r,loc,z,-1038.1,102.1
enode,1
/title,Pad Strip C-D - Line 8
eplo
nsel,r,loc,z,101.9,102.1
spoint,,408.0,-45.0,102.0
fsum
nelem
/com
/com  internal forces at Z = -102.0 LINE 7
/com
nsel,r,loc,z,-1038.1,-101.9
enode,1
/title,Pad Strip C-D - Line 7
eplo
nsel,r,loc,z,-101.9,-102.1
spoint,,408.0,-45.0,-102.0
fsum
nelem
/com
/com  internal forces at Z = -306.0 LINE 6
/com
nsel,r,loc,z,-1038.1,-305.9
enode,1
/title,Pad Strip C-D - Line 6
eplo
nsel,r,loc,z,-305.9,-306.1
spoint,,408.0,-45.0,-306.0
fsum
nelem
/com
/com  internal forces at Z = -510.0 LINE 5
/com
```

```
nsel,r,loc,z,-1038.1,-509.9
enode,1
/title,Pad Strip C-D - Line 5
eplo
nsel,r,loc,z,-509.9,-510.1
spoint,,408.0,-45.0,-510.0
fsum
nelem
/com
/com  internal forces at Z = -714.0 LINE 4
/com
nsel,r,loc,z,-1038.1,-713.9
enode,1
/title,Pad Strip C-D - Line 4
eplo
nsel,r,loc,z,-713.9,-714.1
spoint,,408.0,-45.0,-714.0
fsum
nelem
/com
/com  internal forces at Z = -918.0 LINE 3
/com
nsel,r,loc,z,-1038.1,-917.9
enode,1
/title,Pad Strip C-D - Line 3
eplo
nsel,r,loc,z,-917.9,-918.1
spoint,,408.0,-45.0,-918.0
fsum
nelem
/com
/com  internal forces at Z = -978.0 LINE 2
/com
nsel,r,loc,z,-1038.1,-977.9
enode,1
/title,Pad Strip C-D - Line 2, Line 1 on far side
eplo
nsel,r,loc,z,-977.9,-978.1
spoint,,408.0,-45.0,-978.0
fsum
nelem
/com
/com  internal forces at Z = -1038.0     LINE 1
/com
nsel,r,loc,z,-1037.9,-1038.1
spoint,,408.0,-45.0,-1038.0
fsum
/com  next strip x = 510 to 714 Lines D to E
/com
/com  Select all nodes in pad only
/com
esel,type,1
nelem
eplo
/com
/com  select strip Z direction
/com
```

```
nsel,r,loc,x,509.9,714.1
enode,1
/title,Pad Strip D-E - Line 10
eplo
/com
/com  internal forces at Z = 222.0  LINE 10
/com
nsel,r,loc,z,221.9,222.1
spoint,,612.0,-45.0,222.0
fsum
nelem
/com
/com  internal forces at Z = 162.0  LINE 9
/com
nsel,r,loc,z,-1038.1,162.1
enode,1
/title,Pad Strip D-E - Line 9
eplo
nsel,r,loc,z,161.9,162.1
spoint,,612.0,-45.0,162.0
fsum
nelem
/com
/com  internal forces at Z = 102.0  LINE 8
/com
nsel,r,loc,z,-1038.1,102.1
enode,1
/title,Pad Strip D-E - Line 8
eplo
nsel,r,loc,z,101.9,102.1
spoint,,612.0,-45.0,102.0
fsum
nelem
/com
/com  internal forces at Z = -102.0 LINE 7
/com
nsel,r,loc,z,-1038.1,-101.9
enode,1
/title,Pad Strip D-E - Line 7
eplo
nsel,r,loc,z,-101.9,-102.1
spoint,,612.0,-45.0,-102.0
fsum
nelem
/com
/com  internal forces at Z = -306.0 LINE 6
/com
nsel,r,loc,z,-1038.1,-305.9
enode,1
/title,Pad Strip D-E - Line 6
eplo
nsel,r,loc,z,-305.9,-306.1
spoint,,612.0,-45.0,-306.0
fsum
nelem
/com
/com  internal forces at Z = -510.0 LINE 5
```

```
/com
nsel,r,loc,z,-1038.1,-509.9
enode,1
/title,Pad Strip D-E - Line 5
eplo
nsel,r,loc,z,-509.9,-510.1
spoint,,612.0,-45.0,-510.0
fsum
nelem
/com
/com  internal forces at Z = -714.0 LINE 4
/com
nsel,r,loc,z,-1038.1,-713.9
enode,1
/title,Pad Strip D-E - Line 4
eplo
nsel,r,loc,z,-713.9,-714.1
spoint,,612.0,-45.0,-714.0
fsum
nelem
/com
/com  internal forces at Z = -918.0 LINE 3
/com
nsel,r,loc,z,-1038.1,-917.9
enode,1
/title,Pad Strip D-E - Line 3
eplo
nsel,r,loc,z,-917.9,-918.1
spoint,,612.0,-45.0,-918.0
fsum
nelem
/com
/com  internal forces at Z = -978.0 LINE 2
/com
nsel,r,loc,z,-1038.1,-977.9
enode,1
/title,Pad Strip D-E - Line 2, Line 1 on far side
eplo
nsel,r,loc,z,-977.9,-978.1
spoint,,612.0,-45.0,-978.0
fsum
nelem
/com
/com  internal forces at Z = -1038.0      LINE 1
/com
nsel,r,loc,z,-1037.9,-1038.1
spoint,,612.0,-45.0,-1038.0
fsum
/com ***************************************************************************
/com ***************************************************************************
/com
/COM  SECTION THE PAD IN TO 7 EAST-WEST X-DIRECTION STRIPS
/COM
/com  Select all nodes in pad only
/com
esel,type,1
nelem
```

```
eplo
/com
/com  select strip x direction z = -1038 to -918 Lines 1 to 3
/com
nsel,r,loc,z,-1038.1,-917.9
enode,1
/title,Pad Strip 1-3 - Line E
eplo
/com
/com  internal forces at x = 714.0  LINE E
/com
nsel,r,loc,x,713.9,714.1
spoint,,714.0,-45.0,-978.0
fsum
nelem
/com
/com  internal forces at x = 510.0  LINE D
/com
nsel,r,loc,x,-102.1,510.1
enode,1
/title,Pad Strip 1-3 - Line D
eplo
nsel,r,loc,x,509.9,510.1
spoint,,510.0,-45.0,-978.0
fsum
nelem
/com
/com  internal forces at x = 306.0  LINE C
/com
nsel,r,loc,x,-102.1,306.1
enode,1
/title,Pad Strip 1-3 - Line C
eplo
nsel,r,loc,x,305.9,306.1
spoint,,306.0,-45.0,-978.0
fsum
nelem
/com
/com  internal forces at x = 102.0  LINE B
/com
nsel,r,loc,x,-102.1,102.1
enode,1
/title,Pad Strip 1-3 - Line B, Line A on far side
eplo
nsel,r,loc,x,101.9,102.1
spoint,,102.0,-45.0,-978.0
fsum
nelem
/com
/com  internal forces at x = -102.0 LINE A
/com
nsel,r,loc,x,-102.1,-101.9
spoint,,-102.0,-45.0,-978.0
fsum
nelem
/com
/com  next strip z = -918 to -714 Lines 3 to 4
```

```
/com
/com
/com  Select all nodes in pad only
/com
esel,type,1
nelem
eplo
/com
/com  select strip x direction z = -918 to -714
/com
nsel,r,loc,z,-918.1,-713.9
enode,1
/title,Pad Strip 3-4 - Line E
eplo
/com
/com  internal forces at x = 714.0  LINE E
/com
nsel,r,loc,x,713.9,714.1
spoint,,714.0,-45.0,-816.0
fsum
nelem
/com
/com  internal forces at x = 510.0  LINE D
/com
nsel,r,loc,x,-102.1,510.1
enode,1
/title,Pad Strip 3-4 - Line D
eplo
nsel,r,loc,x,509.9,510.1
spoint,,510.0,-45.0,-816.0
fsum
nelem
/com
/com  internal forces at x = 306.0  LINE C
/com
nsel,r,loc,x,-102.1,306.1
enode,1
/title,Pad Strip 3-4 - Line C
eplo
nsel,r,loc,x,305.9,306.1
spoint,,306.0,-45.0,-816.0
fsum
nelem
/com
/com  internal forces at x = 102.0  LINE B
/com
nsel,r,loc,x,-102.1,102.1
enode,1
/title,Pad Strip 3-4 - Line B, Line A on far side
eplo
nsel,r,loc,x,101.9,102.1
spoint,,102.0,-45.0,-816.0
fsum
nelem
/com
/com  internal forces at x = -102.0 LINE A
/com
```

```
nsel,r,loc,x,-102.1,-101.9
spoint,,-102.0,-45.0,-816.0
fsum
nelem
/com
/com  next strip z = -714 to -510 Lines 4 to 5
/com
/com
/com  Select all nodes in pad only
/com
esel,type,1
nelem
eplo
/com
/com  select strip x direction z = -714 to -510
/com
nsel,r,loc,z,-714.1,-509.9
enode,1
/title,Pad Strip 4-5 - Line E
eplo
/com
/com  internal forces at x = 714.0  LINE E
/com
nsel,r,loc,x,713.9,714.1
spoint,,714.0,-45.0,-612.0
fsum
nelem
/com
/com  internal forces at x = 510.0  LINE D
/com
nsel,r,loc,x,-102.1,510.1
enode,1
/title,Pad Strip 4-5 - Line D
eplo
nsel,r,loc,x,509.9,510.1
spoint,,510.0,-45.0,-612.0
fsum
nelem
/com
/com  internal forces at x = 306.0  LINE C
/com
nsel,r,loc,x,-102.1,306.1
enode,1
/title,Pad Strip 4-5 - Line C
eplo
nsel,r,loc,x,305.9,306.1
spoint,,306.0,-45.0,-612.0
fsum
nelem
/com
/com  internal forces at x = 102.0  LINE B
/com
nsel,r,loc,x,-102.1,102.1
enode,1
/title,Pad Strip 4-5 - Line B, Line A on far side
eplo
nsel,r,loc,x,101.9,102.1
```

```
spoint,,102.0,-45.0,-612.0
fsum
nelem
/com
/com  internal forces at x = -102.0 LINE A
/com
nsel,r,loc,x,-102.1,-101.9
spoint,,-102.0,-45.0,-612.0
fsum
nelem
/com
/com  next strip z = -510 to -306 Lines 5 to 6
/com
/com
/com  Select all nodes in pad only
/com
esel,type,1
nelem
eplo
/com
/com  select strip x direction z = -510 to -306
/com
nsel,r,loc,z,-510.1,-305.9
enode,1
/title,Pad Strip 5-6 - Line E
eplo
/com
/com  internal forces at x = 714.0  LINE E
/com
nsel,r,loc,x,713.9,714.1
spoint,,714.0,-45.0,-408.0
fsum
nelem
/com
/com  internal forces at x = 510.0  LINE D
/com
nsel,r,loc,x,-102.1,510.1
enode,1
/title,Pad Strip 5-6 - Line D
eplo
nsel,r,loc,x,509.9,510.1
spoint,,510.0,-45.0,-408.0
fsum
nelem
/com
/com  internal forces at x = 306.0  LINE C
/com
nsel,r,loc,x,-102.1,306.1
enode,1
/title,Pad Strip 5-6 - Line C
eplo
nsel,r,loc,x,305.9,306.1
spoint,,306.0,-45.0,-408.0
fsum
nelem
/com
/com  internal forces at x = 102.0  LINE B
```

```
/com
nsel,r,loc,x,-102.1,102.1
enode,1
/title,Pad Strip 5-6 - Line B, Line A on far side
eplo
nsel,r,loc,x,101.9,102.1
spoint,,102.0,-45.0,-408.0
fsum
nelem
/com
/com  internal forces at x = -102.0 LINE A
/com
nsel,r,loc,x,-102.1,-101.9
spoint,,-102.0,-45.0,-408.0
fsum
nelem
/com
/com  next strip z = -306 to -102 Lines 6 to 7
/com
/com
/com  Select all nodes in pad only
/com
esel,type,1
nelem
eplo
/com
/com  select strip x direction z = -306 to -102
/com
nsel,r,loc,z,-306.1,-101.9
enode,1
/title,Pad Strip 6-7 - Line E
eplo
/com
/com  internal forces at x = 714.0  LINE E
/com
nsel,r,loc,x,713.9,714.1
spoint,,714.0,-45.0,-204.0
fsum
nelem
/com
/com  internal forces at x = 510.0  LINE D
/com
nsel,r,loc,x,-102.1,510.1
enode,1
/title,Pad Strip 6-7 - Line D
eplo
nsel,r,loc,x,509.9,510.1
spoint,,510.0,-45.0,-204.0
fsum
nelem
/com
/com  internal forces at x = 306.0  LINE C
/com
nsel,r,loc,x,-102.1,306.1
enode,1
/title,Pad Strip 6-7 - Line C
eplo
```

```
nsel,r,loc,x,305.9,306.1
spoint,,306.0,-45.0,-204.0
fsum
nelem
/com
/com  internal forces at x = 102.0  LINE B
/com
nsel,r,loc,x,-102.1,102.1
enode,1
/title,Pad Strip 6-7 - Line B, Line A on far side
eplo
nsel,r,loc,x,101.9,102.1
spoint,,102.0,-45.0,-204.0
fsum
nelem
/com
/com  internal forces at x = -102.0 LINE A
/com
nsel,r,loc,x,-102.1,-101.9
spoint,,-102.0,-45.0,-204.0
fsum
nelem
/com
/com  next strip z = -102 to 102 Lines 7 to 8
/com
/com
/com  Select all nodes in pad only
/com
esel,type,1
nelem
eplo
/com
/com  select strip x direction z = -102 to 102
/com
nsel,r,loc,z,-102.1,102.1
enode,1
/title,Pad Strip 7-8 - Line E
eplo
/com
/com  internal forces at x = 714.0  LINE E
/com
nsel,r,loc,x,713.9,714.1
spoint,,714.0,-45.0,0.0
fsum
nelem
/com
/com  internal forces at x = 510.0  LINE D
/com
nsel,r,loc,x,-102.1,510.1
enode,1
/title,Pad Strip 7-8 - Line D
eplo
nsel,r,loc,x,509.9,510.1
spoint,,510.0,-45.0,0.0
fsum
nelem
/com
```

```
/com  internal forces at x = 306.0  LINE C
/com
nsel,r,loc,x,-102.1,306.1
enode,1
/title,Pad Strip 7-8 - Line C
eplo
nsel,r,loc,x,305.9,306.1
spoint,,306.0,-45.0,0.0
fsum
nelem
/com
/com  internal forces at x = 102.0  LINE B
/com
nsel,r,loc,x,-102.1,102.1
enode,1
/title,Pad Strip 7-8 - Line B, Line A on far side
eplo
nsel,r,loc,x,101.9,102.1
spoint,,102.0,-45.0,0.0
fsum
nelem
/com
/com  internal forces at x = -102.0 LINE A
/com
nsel,r,loc,x,-102.1,-101.9
spoint,,-102.0,-45.0,0.0
fsum
nelem
/com
/com  next strip z = 102 to 222 Lines 8 to 10
/com
/com
/com  Select all nodes in pad only
/com
esel,type,1
nelem
eplo
/com
/com  select strip x direction z = 102 to 222
/com
nsel,r,loc,z,101.9,222.1
enode,1
/title,Pad Strip 8-10 - Line E
eplo
/com
/com  internal forces at x = 714.0  LINE E
/com
nsel,r,loc,x,713.9,714.1
spoint,,714.0,-45.0,162.0
fsum
nelem
/com
/com  internal forces at x = 510.0  LINE D
/com
nsel,r,loc,x,-102.1,510.1
enode,1
/title,Pad Strip 8-10 - Line D
```

```
eplo
nsel,r,loc,x,509.9,510.1
spoint,,510.0,-45.0,162.0
fsum
nelem
/com
/com  internal forces at x = 306.0  LINE C
/com
nsel,r,loc,x,-102.1,306.1
enode,1
/title,Pad Strip 8-10 - Line C
eplo
nsel,r,loc,x,305.9,306.1
spoint,,306.0,-45.0,162.0
fsum
nelem
/com
/com  internal forces at x = 102.0  LINE B
/com
nsel,r,loc,x,-102.1,102.1
enode,1
/title,Pad Strip 8-10 - Line B, Line A on far side
eplo
nsel,r,loc,x,101.9,102.1
spoint,,102.0,-45.0,162.0
fsum
nelem
/com
/com  internal forces at x = -102.0 LINE A
/com
nsel,r,loc,x,-102.1,-101.9
spoint,,-102.0,-45.0,162.0
fsum
nelem
/auto
eall
nall
eplo
/com
/auto
eall
nall
/RGB,INDEX,  0,  0,  0, 0
/RGB,INDEX, 60, 60, 60,13
/RGB,INDEX, 80, 80, 80,14
/RGB,INDEX,100,100,100,15
eplo
fini
/output
/exit
```

Originator: S. C. Tumminelli
Date: May 25, 2001
Reissued: November 30, 2001

Appendix RL-1

Reaction Loads

This Appendix presents reaction loads of the model for all 19 load cases. They are applicable to the soft rock, hard rock and very hard rock models.

The first part of the calculation computes the expected forces. Input values are from Appendix AL-1. The sum of all applied loads are calculated followed by the sum of the forces at the pad/rock interface and the sum at the boundary of the rock. Since the rock is massless, the last two values are the same.

Then the databases are scanned for the same data. The first input file that processes the data is provided. This file processes data for both the soft rock and hard rock models in one execution, however, two output files are created. Then the results for the soft and hard rock analyses are provided. This is then followed by the input and output files for the very hard rock model.

A comparison of the expected forces and the forces scanned from the databases shows that the values are the same. This indicates that the analyses are in equilibrium and that, together with a review of the displacement plots, provides high confidence that the analyses are correct.

Appendix Contents

Manual reaction calculations	sheet 2
ANSYS input file for reactions for soft and hard rock models	sheet 9
ANSYS output file for reactions for the soft rock model	sheet 26
ANSYS output file for reactions for the hard rock model	sheet 51
ANSYS input file for reactions for the very hard rock model	sheet 76
ANSYS output file for reactions for the very hard rock model	sheet 85

Below are the calculations that compute the expected reactions from the ANSYS analyses:

Pad Weight is 68*105*7.5*0.15 = 8032.5 Kip

Load Step 1 Gravity

Sum of Applied Loads

Fx	= 0
Fy = 360000*20	= 7200000
Fz	= 0

Sum of Forces at Pad/Rock Interface and at Rock Boundary

Fx	= 0
Fy = 360000*20 + 8032500	= 15232500
Fz	= 0

Load Step 2 - Apply in the North (Z) direction:

Sum of Applied Loads

Fx	= 0
Fy = 267040*20	= 5340800
Fz = 515000*20	= 10300000

Sum of Forces at Pad/Rock Interface and at Rock Boundary

Fx =	= 0
Fy = 267040*20 + 0.800*8032500	= 11766800
Fz = 515000*20 + 0.808*8032500	= 16790260

Load Step 3 - Apply in the North 32.93 degrees West direction:

Sum of Applied Loads

Fx = 279961*20	= 5599220
Fy = 267040*20	= 5340800
Fz = 432258*20	= 8645160

Sum of Forces at Pad/Rock Interface and at Rock Boundary

Fx = 279961*20 + 0.439 *8032500	= 9125488
Fy = 267040*20 + 0.800*8032500	= 11766800

Fz = 432258*20 + 0.678*8032500 = 14091195

Load Step 4 - Apply in the North 45 degrees West direction:

Sum of Applied Loads

Fx = 364160*20 = 7283200
Fy = 267040*20 = 5340800
Fz = 364160*20 = 7283200

Sum of Forces at Pad/Rock Interface and at Rock Boundary

Fx = 364160*20 + 0.571*8032500 = 11869758
Fy = 267040*20 + 0.800*8032500 = 11766800
Fz = 364160*20 + 0.571*8032500 = 11869758

Load Step 5 - Apply in the North 57.07 degrees West direction:

Sum of Applied Loads

Fx = 432258*20 = 8645160
Fy = 267040*20 = 5340800
Fz = 279961*20 = 5599220

Sum of Forces at Pad/Rock Interface and at Rock Boundary

Fx = 432258*20 + 0.678*8032500 = 14091195
Fy = 267040*20 + 0.800*8032500 = 11766800
Fz = 279961*20 + 0.439*8032500 = 9125488

Load Step 6 - Apply in the West direction

Sum of Applied Loads

Fx = 515000*20 = 10300000
Fy = 267040*20 = 5340800
Fz = 0

Sum of Forces at Pad/Rock Interface and at Rock Boundary

Fx = 515000*20 + 0.808*8032500 = 16790260
Fy = 267040*20 + 0.800*8032500 = 11766800
Fz = 0

Load Step 7 - Apply in the North direction

Sum of Applied Loads

Fx	= 0
Fy = 127600*20	=2552000
Fz = 206000*20	= 4120000

Sum of Forces at Pad/Rock Interface and at Rock Boundary

Fx	= 0
Fy = 127600*20 + 0.500*8032500	= 6568250
Fz = 206000*20 + 0.424*8032500	= 7525780

Load Step 8 - Apply in the West direction:

Sum of Applied Loads

Fx = 206000*20	= 4120000
Fy = 127600*20	= 2552000
Fz	= 0

Sum of Forces at Pad/Rock Interface and at Rock Boundary

Fx = 206000*20 + 0.424*8032500	= 7525780
Fy = 127600*20 + 0.500*8032500	= 6568250
Fz	= 0

Load Step 9 - Apply in the North direction:

Sum of Applied Loads

Fx	= 0
Fy = 773300*20	= 15466000
Fz = 171200*20	= 3424000

Sum of Forces at Pad/Rock Interface and at Rock Boundary

Fx	= 0
Fy = 773300*20 + 1.500*8032500	= 27514750
Fz = 171200*20 + 0.424*8032500	= 6829780

Load Step 10 - Apply in the West direction:

Sum of Applied Loads

Fx = 171200*20 = 3424000
Fy = 773300*20 = 15466000
Fz = 0

Sum of Forces at Pad/Rock Interface and at Rock Boundary

Fx = 171200*20 + 0.424*8032500 = 6829780
Fy = 773300*20 + 1.500*8032500 = 27514750
Fz = 0

Load Step 11 - Apply in the North (Z) direction:

Sum of Applied Loads

Fx = 0
Fy = 258320*20 = 5166400
Fz = 440000*20 = 8800000

Sum of Forces at Pad/Rock Interface and at Rock Boundary

Fx = 0
Fy = 258320*20 + 0.720*8032500 = 10949800
Fz = 440000*20 + 0.894*8032500 = 15981055

Load Step 12 - Apply in the North 32.93 degrees West direction:

Sum of Applied Loads

Fx = 239190*20 = 4783800
Fy = 258320*20 = 5166400
Fz = 369308*20 = 7386160

Sum of Forces at Pad/Rock Interface and at Rock Boundary

Fx = 239190*20 + 0.486*8032500 = 8687595
Fy = 258320*20 + 0.720*8032500 = 10949800
Fz = 369308*20 + 0.750*8032500 = 13410535

Load Step 13 - Apply in the North 45 degrees West direction:

Sum of Applied Loads

Fx = 311127*20 = 6222540
Fy = 258320*20 = 5166400
Fz = 311127*20 = 6222540

Sum of Forces at Pad/Rock Interface and at Rock Boundary

Fx = 311127*20 + 0.632*8032500 = 11299080
Fy = 258320*20 + 0.720*8032500 = 10949800
Fz = 311127*20 + 0.632*8032500 = 11299080

Load Step 14 - Apply in the North 57.07 degrees West direction:

Sum of Applied Loads

Fx = 369308*20 = 7386160
Fy = 258320*20 = 5166400
Fz = 239190*20 = 4783800

Sum of Forces at Pad/Rock Interface and at Rock Boundary

Fx = 369308*20 + 0.750*8032500 = 13410535
Fy = 258320*20 + 0.720*8032500 = 10949800
Fz = 239190*20 + 0.486*8032500 = 8687595

Load Step 15 - Apply in the West direction:

Sum of Applied Loads

Fx = 440000*20 = 8800000
Fy = 258320*20 = 5166400
Fz = 0

Sum of Forces at Pad/Rock Interface and at Rock Boundary

Fx = 440000*20 + 0.894*8032500 = 15981055
Fy = 258320*20 + 0.720*8032500 = 10949800
Fz = 0

Load Step 16 - Apply in the North direction:

Sum of Applied Loads

Fx = 0
Fy = 105800*20 = 2116000

Fz = 176000*20 = 3520000

Sum of Forces at Pad/Rock Interface and at Rock Boundary

Fx = 0
Fy = 105800*20 + 0.300*8032500 = 4525750
Fz = 176000*20 + 0.470*8032500 = 7295275

Load Step 17 - Apply in the West direction:

Sum of Applied Loads

Fx = 176000*20 = 3520000
Fy = 105800*20 = 2116000
Fz = 0

Sum of Forces at Pad/Rock Interface and at Rock Boundary

Fx = 176000*20 + 0.470*8032500 = 7295275
Fy = 105800*20 + 0.300*8032500 = 4525750
Fz = 0

Load Step 18 - Apply in the North direction:

Sum of Applied Loads

Fx = 0
Fy = 55600*20 = 1112000
Fz = 156000*20 = 3120000

Sum of Forces at Pad/Rock Interface and at Rock Boundary

Fx = 0
Fy = 55600*20 + 0.300*8032500 = 3521750
Fz = 156000*20 + 0.470*8032500 = 6895275

Load Step 19 - Apply in the West direction:

Sum of Applied Loads

Fx = 156000*20 = 3120000
Fy = 55600*20 = 1112000
Fz = 0

Sum of Forces at Pad/Rock Interface and at Rock Boundary

Fx = 156000*20 + 0.470*8032500 = 6895275
Fy = 55600*20 + 0.300*8032500 = 3521750
Fz = 0

Below is the file that scans the ANSYS database for the applied forces, the forces at the pad/rock interface and the boundary forces on the rock. It creates two output files, one for the soft rock model and one for the hard rock model.

```
/com,
/com, This routine processes load results data for the
/com,   evaluation of equilibrium.
/com
/com,   Soft Rock Load Step Results
/com
/output,padsoftreac,out
/com
/com ***************************************************************************
/com ***************************************************************************
/com ***************************************************************************
/com ***************************************************************************
/com ***************************************************************************
/com ***************************************************************************
/com
/com ************************ Soft Rock Reactions ****************************
/com
/file,dcslabs2
resume
/post1
/com
/com ***************************************************************************
/com ***************************************************************************
/com *************************  LOAD CASE 1 **********************************
set,1
eall
cmsel,s,cask
/com
/com ******* SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com ***************************************************************************
/com ***************************************************************************
/com *************************  LOAD CASE 2 **********************************
set,2
eall
cmsel,s,cask
/com
```

```
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com ************************************************************************
/com ************************************************************************
/com *************************  LOAD CASE 3 ***********************************
set,3
eall
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com ************************************************************************
/com ************************************************************************
/com *************************  LOAD CASE 4 ***********************************
set,4
eall
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
/com
cmsel,s,boundary
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
```

```
fsum
/com
/com
/com ************************************************************************
/com ************************************************************************
/com *************************  LOAD CASE 5 ***********************************
set,5
eall
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com ************************************************************************
/com ************************************************************************
/com *************************  LOAD CASE 6 ***********************************
set,6
eall
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com ************************************************************************
/com ************************************************************************
/com *************************  LOAD CASE 7 ***********************************
set,7
eall
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
```

```
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com ***************************************************************************
/com ***************************************************************************
/com *************************  LOAD CASE 8 ***********************************
set,8
eall
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com ***************************************************************************
/com ***************************************************************************
/com *************************  LOAD CASE 9 ***********************************
set,9
eall
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
```

```
/com
/com
/com ***************************************************************************
/com ***************************************************************************
/com *************************  LOAD CASE 10 ********************************
set,10
eall
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com ***************************************************************************
/com ***************************************************************************
/com *************************  LOAD CASE 11 ********************************
set,11
eallr
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com
/com
/com ***************************************************************************
/com ***************************************************************************
/com *************************  LOAD CASE 12 ********************************
set,12
eallr
cmsel,s,cask
/com
```

```
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com
/com
/com ***************************************************************************
/com ***************************************************************************
/com *************************  LOAD CASE 13 ********************************
set,13
eallr
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com
/com
/com ***************************************************************************
/com ***************************************************************************
/com *************************  LOAD CASE 14 ********************************
set,14
eallr
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
```

```
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com
/com
/com ************************************************************************
/com ************************************************************************
/com *************************  LOAD CASE 15 ********************************
set,15
eallr
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com
/com
/com ************************************************************************
/com ************************************************************************
/com *************************  LOAD CASE 16 ********************************
set,16
eallr
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
```

```
/com
/com
/com ***************************************************************************
/com ***************************************************************************
/com *************************  LOAD CASE 17 ********************************
set,17
eallr
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com
/com
/com ***************************************************************************
/com ***************************************************************************
/com *************************  LOAD CASE 18 ********************************
set,18
eallr
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com
/com
/com ***************************************************************************
/com ***************************************************************************
/com *************************  LOAD CASE 19 ********************************
set,19
eallr
```

```
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
finish
/output,padhardreac,out
/com
/com ***************************************************************************
/com ***************************************************************************
/com ***************************************************************************
/com ***************************************************************************
/com ***************************************************************************
/com ***************************************************************************
/com
/com ************************ Hard Rock Reactions ****************************
/com
/file,dcslabh2
resume
/post1
/com
/com ***************************************************************************
/com ***************************************************************************
/com *************************  LOAD CASE 1 ***********************************
set,1
eall
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
```

```
/com ************************************************************************
/com ************************************************************************
/com *************************  LOAD CASE 2 ***********************************
set,2
eall
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com ************************************************************************
/com ************************************************************************
/com *************************  LOAD CASE 3 ***********************************
set,3
eall
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com ************************************************************************
/com ************************************************************************
/com *************************  LOAD CASE 4 ***********************************
set,4
eall
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
```

```
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com ************************************************************************
/com ************************************************************************
/com *************************  LOAD CASE 5 ***********************************
set,5
eall
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com ************************************************************************
/com ************************************************************************
/com *************************  LOAD CASE 6 ***********************************
set,6
eall
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com ************************************************************************
```

```
/com ************************************************************************
/com *************************  LOAD CASE 7 **********************************
set,7
eall
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com ************************************************************************
/com ************************************************************************
/com *************************  LOAD CASE 8 **********************************
set,8
eall
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com ************************************************************************
/com ************************************************************************
/com *************************  LOAD CASE 9 **********************************
set,9
eall
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
```

```
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com ***************************************************************************
/com ***************************************************************************
/com *************************  LOAD CASE 10 ********************************
set,10
eall
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com ***************************************************************************
/com ***************************************************************************
/com *************************  LOAD CASE 11 ********************************
set,11
eallr
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com
/com
```

```
/com ***************************************************************************
/com ***************************************************************************
/com *************************  LOAD CASE 12 ********************************
set,12
eallr
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com
/com
/com ***************************************************************************
/com ***************************************************************************
/com *************************  LOAD CASE 13 ********************************
set,13
eallr
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com
/com
/com ***************************************************************************
/com ***************************************************************************
/com *************************  LOAD CASE 14 ********************************
set,14
eallr
cmsel,s,cask
/com
```

```
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com
/com
/com ***************************************************************************
/com ***************************************************************************
/com *************************  LOAD CASE 15 ********************************
set,15
eallr
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com
/com
/com ***************************************************************************
/com ***************************************************************************
/com *************************  LOAD CASE 16 ********************************
set,16
eallr
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
```

```
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com
/com
/com ****************************************************************************
/com ****************************************************************************
/com *************************  LOAD CASE 17 ********************************
set,17
eallr
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com
/com
/com ****************************************************************************
/com ****************************************************************************
/com *************************  LOAD CASE 18 ********************************
set,18
eallr
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
```

```
/com
/com
/com ***************************************************************************
/com ***************************************************************************
/com *************************  LOAD CASE 19 ********************************
set,19
eallr
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
fini
/output
/exit
```

Below are the equilibrium results for the soft rock analyses:

```
*****************************************************************************
*****************************************************************************
*****************************************************************************
*****************************************************************************
*****************************************************************************
*****************************************************************************

************************* Soft Rock Reactions ****************************


CURRENT JOBNAME REDEFINED AS dcslabs2

RESUME ANSYS DATA FROM FILE NAME=dcslabs2.db

*** ANSYS GLOBAL STATUS ***

TITLE = Pad, LTSP(4), 20 Casks, 156 Kips West (X), Max Up, Soft Rock
ANALYSIS TYPE =  STATIC (STEADY-STATE)
NUMBER OF ELEMENT TYPES =      6
  15348 ELEMENTS CURRENTLY SELECTED.  MAX ELEMENT NUMBER =    33177
  17051 NODES CURRENTLY SELECTED.     MAX NODE NUMBER =       17051
    259 KEYPOINTS CURRENTLY SELECTED. MAX KEYPOINT NUMBER =     259
    250 LINES CURRENTLY SELECTED.     MAX LINE NUMBER =         396
    181 AREAS CURRENTLY SELECTED.     MAX AREA NUMBER =         295
     70 VOLUMES CURRENTLY SELECTED.   MAX VOL. NUMBER =          70
    11 COMPONENTS CURRENTLY DEFINED
MAXIMUM LINEAR PROPERTY NUMBER        =       5
MAXIMUM REAL CONSTANT SET NUMBER      =       6
ACTIVE COORDINATE SYSTEM              =       0  (CARTESIAN)
MAXIMUM CONSTRAINT EQUATION NUMBER    =    4620
NUMBER OF SPECIFIED CONSTRAINTS       =    2193
NUMBER OF NODAL LOADS                 =    2160
CURRENT LOAD CASE =      0 OF      0
LOAD SET    =      19
SUBSTEP     =       1
TIME/FREQ   =    19.000

INITIAL JOBNAME = dcslabs2
CURRENT JOBNAME = dcslabs2

***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7     *****
ANSYS/Structural U
00150104          VERSION=INTEL NT      09:58:36  APR 12, 2001 CP=      3.635

Pad, LTSP(4), 20 Casks, 156 Kips West (X), Max Up, Soft Rock


         ***** ANSYS RESULTS INTERPRETATION (POST1) *****

ENTER  /SHOW,DEVICE-NAME  TO ENABLE GRAPHIC DISPLAY
```

```
ENTER  FINISH              TO LEAVE POST1

*** NOTE ***                            CP=      3.635   TIME= 09:58:36
Reading results into the database (SET command) will update the current
 displacement and force boundary conditions in the database with the
 values from the results file for that load set.  Note that any
 subsequent solutions will use these values unless action is taken to
 either SAVE the current values or not overwrite them (/EXIT,NOSAVE).

***************************************************************************
***************************************************************************
*************************  LOAD CASE 1 **********************************


USE LOAD STEP     1  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     1  SUBSTEP=     1  CUMULATIVE ITERATION=     4
  TIME/FREQUENCY=  1.0000
TITLE= Pad, Gravity, 20 Casks, Soft Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  = -0.2721180E-05
 FY  =   7200000.
 FZ  =  0.2814517E-04
 MX  =  0.2937600E+10
 MY  = -0.1065199E-01
 MZ  =  0.2203200E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  = -0.5456018E-04
 FY  = -0.1523250E+08
 FZ  =  0.3169748E-04
 MX  = -0.6214860E+10
 MY  =  0.2822164E-01
 MZ  = -0.4661145E+10

SUMMATION POINT=  0.0000      0.0000      0.0000
```

```
ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.9844398E-06
 FY  = -0.1523250E+08
 FZ  = -0.9289377E-03
 MX  = -0.6214860E+10
 MY  =  0.2820099
 MZ  = -0.4661145E+10

SUMMATION POINT=  0.0000      0.0000      0.0000


*************************************************************************
*************************************************************************
*************************  LOAD CASE 2 **********************************


USE LOAD STEP    2  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     2  SUBSTEP=     1  CUMULATIVE ITERATION=    17
  TIME/FREQUENCY=  2.0000
TITLE= Pad, HE(1), 20 Casks, 515 Kips North (Z), Soft Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.8543066E-05
 FY  =   5340800.
 FZ  = -0.1030000E+08
 MX  =  0.9584964E+09
 MY  =  0.3151800E+10
 MZ  =  0.1634285E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE
```

```
******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.5526232E-04
 FY  = -0.1176680E+08
 FZ  =  0.1679026E+08
 MX  = -0.3872366E+10
 MY  = -0.5137820E+10
 MZ  = -0.3600641E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.9438505E-05
 FY  = -0.1176680E+08
 FZ  =  0.1679026E+08
 MX  = -0.3872366E+10
 MY  = -0.5137820E+10
 MZ  = -0.3600641E+10

SUMMATION POINT=  0.0000      0.0000      0.0000


*************************************************************************
*************************************************************************
*************************  LOAD CASE 3 ***********************************


USE LOAD STEP     3  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     3  SUBSTEP=     1  CUMULATIVE ITERATION=    26
  TIME/FREQUENCY=  3.0000
TITLE= Pad, HE(1), 20 Casks, 515 Kips N 32.93 W (Z,X), Soft Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  -5599220.
 FY  =   5340800.
 FZ  =  -8645160.
 MX  =  0.1154595E+10
```

```
 MY  =  0.4929901E+10
 MZ  =  0.2297792E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =   9125487.
 FY  = -0.1176680E+08
 FZ  =  0.1409120E+08
 MX  = -0.4021475E+10
 MY  = -0.8035105E+10
 MZ  = -0.4105466E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =   9125487.
 FY  = -0.1176680E+08
 FZ  =  0.1409119E+08
 MX  = -0.4021475E+10
 MY  = -0.8035105E+10
 MZ  = -0.4105466E+10

SUMMATION POINT=  0.0000      0.0000      0.0000


*************************************************************************
*************************************************************************
*************************  LOAD CASE 4  *********************************


USE LOAD STEP     4  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     4  SUBSTEP=     1  CUMULATIVE ITERATION=    30
  TIME/FREQUENCY=  4.0000
TITLE= Pad, HE(1), 20 Casks, 515 Kips N 45 W (Z,X), Soft Rock
```

```
   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  -7283200.
 FY  =   5340800.
 FZ  =  -7283200.
 MX  =  0.1315987E+10
 MY  =  0.5200205E+10
 MZ  =  0.2497344E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1186976E+08
 FY  = -0.1176680E+08
 FZ  =  0.1186976E+08
 MX  = -0.4144190E+10
 MY  = -0.8475007E+10
 MZ  = -0.4257305E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.


SELECT      COMPONENT BOUNDARY
******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1186976E+08
 FY  = -0.1176680E+08
 FZ  =  0.1186976E+08
 MX  = -0.4144190E+10
 MY  = -0.8475007E+10
 MZ  = -0.4257305E+10

SUMMATION POINT=  0.0000      0.0000      0.0000
```

```
*************************************************************************
*************************************************************************
*************************  LOAD CASE 5  ***********************************

USE LOAD STEP     5  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     5  SUBSTEP=     1  CUMULATIVE ITERATION=    34
  TIME/FREQUENCY=  5.0000
TITLE= Pad, HE(1), 20 Casks, 515 Kips N 57.07 W (Z,X), Soft Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  -8645160.
 FY  =   5340800.
 FZ  =  -5599220.
 MX  =  0.1515539E+10
 MY  =  0.5240587E+10
 MZ  =  0.2658736E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1409120E+08
 FY  = -0.1176680E+08
 FZ  =   9125487.
 MX  = -0.4296029E+10
 MY  = -0.8541607E+10
 MZ  = -0.4380021E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
```

```
***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1409119E+08
 FY  = -0.1176680E+08
 FZ  =   9125487.
 MX  = -0.4296029E+10
 MY  = -0.8541607E+10
 MZ  = -0.4380021E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

*************************************************************************
*************************************************************************
*************************  LOAD CASE 6 ***********************************

USE LOAD STEP     6  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     6  SUBSTEP=     1  CUMULATIVE ITERATION=    42
  TIME/FREQUENCY=  6.0000
TITLE= Pad, HE(1), 20 Casks, 515 Kips West (W), Soft Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  = -0.1030000E+08
 FY  =   5340800.
 FZ  = -0.1218117E-04
 MX  =  0.2179046E+10
 MY  =  0.4202400E+10
 MZ  =  0.2854835E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1679026E+08
 FY  = -0.1176680E+08
 FZ  =  0.7937852E-05
 MX  = -0.4800854E+10
 MY  = -0.6850426E+10
 MZ  = -0.4529129E+10
```

```
SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1679026E+08
 FY  = -0.1176680E+08
 FZ  = -0.4391488E-03
 MX  = -0.4800854E+10
 MY  = -0.6850426E+10
 MZ  = -0.4529129E+10

SUMMATION POINT=  0.0000      0.0000      0.0000


*************************************************************************
*************************************************************************
*************************  LOAD CASE 7 ***********************************


USE LOAD STEP     7  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     7  SUBSTEP=     1  CUMULATIVE ITERATION=    54
  TIME/FREQUENCY=  7.0000
TITLE= Pad, HE(1), 20 Casks, 206 Kips North (z), Max Up, Soft Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.3215105E-05
 FY  =   2552000.
 FZ  =  -4120000.
 MX  =  0.5529960E+09
 MY  =  0.1260720E+10
 MZ  =  0.7809120E+09

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.
```

```
SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  = -0.1211798E-04
 FY  =  -6568250.
 FZ  =   7525780.
 MX  = -0.2344886E+10
 MY  = -0.2302889E+10
 MZ  = -0.2009884E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  = -0.2419571E-05
 FY  =  -6568250.
 FZ  =   7525780.
 MX  = -0.2344886E+10
 MY  = -0.2302889E+10
 MZ  = -0.2009884E+10

SUMMATION POINT=  0.0000      0.0000      0.0000


*************************************************************************
*************************************************************************
*************************  LOAD CASE 8 ***********************************


USE LOAD STEP     8  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     8  SUBSTEP=     1  CUMULATIVE ITERATION=    63
  TIME/FREQUENCY=  8.0000
TITLE= Pad, HE(1), 20 Casks, 206 Kips West (X), Max Up, Soft Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  -4120000.
 FY  =   2552000.
```

```
 FZ  = -0.5627602E-05
 MX  =  0.1041216E+10
 MY  =  0.1680960E+10
 MZ  =  0.1269132E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =   7525780.
 FY  =  -6568250.
 FZ  = -0.7107511E-05
 MX  = -0.2679846E+10
 MY  = -0.3070518E+10
 MZ  = -0.2344844E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =   7525780.
 FY  =  -6568250.
 FZ  = -0.1351569E-03
 MX  = -0.2679846E+10
 MY  = -0.3070518E+10
 MZ  = -0.2344844E+10

SUMMATION POINT=  0.0000      0.0000      0.0000


*************************************************************************
*************************************************************************
*************************  LOAD CASE 9 ***********************************


USE LOAD STEP     9  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     9  SUBSTEP=     1  CUMULATIVE ITERATION=    69
  TIME/FREQUENCY=  9.0000
```

```
TITLE= Pad, HE(3), 20 Casks, 171.2 Kips North (Z), Max Dn, Soft Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  = -0.1591156E-04
 FY  =  0.1546600E+08
 FZ  =  -3424000.
 MX  =  0.5904384E+10
 MY  =  0.1047744E+10
 MZ  =  0.4732596E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.5125743E-04
 FY  = -0.2751475E+08
 FZ  =   6829780.
 MX  = -0.1097353E+11
 MY  = -0.2089913E+10
 MZ  = -0.8419514E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  = -0.9600777E-05
 FY  = -0.2751475E+08
 FZ  =   6829780.
 MX  = -0.1097353E+11
 MY  = -0.2089913E+10
 MZ  = -0.8419514E+10

SUMMATION POINT=  0.0000      0.0000      0.0000
```

```
*************************************************************************
*************************************************************************
*************************** LOAD CASE 10 ********************************

USE LOAD STEP    10  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=    10  SUBSTEP=     1  CUMULATIVE ITERATION=    73
  TIME/FREQUENCY=  10.000
TITLE= Pad, HE(3), 20 Casks, 171.2 Kips West (X), Max Dn, Soft Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  -3424000.
 FY  =  0.1546600E+08
 FZ  =  0.2441731E-04
 MX  =  0.6310128E+10
 MY  =  0.1396992E+10
 MZ  =  0.5138340E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =   6829780.
 FY  = -0.2751475E+08
 FZ  =  0.3053435E-04
 MX  = -0.1122602E+11
 MY  = -0.2786550E+10
 MZ  = -0.8671997E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY
```

```
******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =   6829780.
 FY  = -0.2751475E+08
 FZ  = -0.2324429E-02
 MX  = -0.1122602E+11
 MY  = -0.2786550E+10
 MZ  = -0.8671997E+10

SUMMATION POINT=  0.0000      0.0000      0.0000


************************************************************************
************************************************************************
************************* LOAD CASE 11 ********************************


USE LOAD STEP    11  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=    11  SUBSTEP=     1  CUMULATIVE ITERATION=    85
  TIME/FREQUENCY=  11.000
TITLE= Pad, LTSP(2), 20 Casks, 440 Kips North (Z), Soft Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  = -0.3154209E-05
 FY  =   5166400.
 FZ  =  -8800000.
 MX  =  0.1065091E+10
 MY  =  0.2692800E+10
 MZ  =  0.1580918E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.2813995E-05
 FY  = -0.1094980E+08
 FZ  =  0.1598106E+08
 MX  = -0.3747866E+10
```

```
 MY  = -0.4890203E+10
 MZ  = -0.3350639E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  = -0.4816393E-05
 FY  = -0.1094980E+08
 FZ  =  0.1598105E+08
 MX  = -0.3747866E+10
 MY  = -0.4890203E+10
 MZ  = -0.3350639E+10

SUMMATION POINT=  0.0000      0.0000      0.0000



*************************************************************************
*************************************************************************
*************************  LOAD CASE 12 *********************************


USE LOAD STEP    12  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=    12  SUBSTEP=     1  CUMULATIVE ITERATION=    94
  TIME/FREQUENCY=  12.000
TITLE= Pad, LTSP(2), 20 Casks, 440 Kips N 32.93 W (Z,X), Soft Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  -4783800.
 FY  =   5166400.
 FZ  =  -7386160.
 MX  =  0.1232631E+10
 MY  =  0.4211955E+10
 MZ  =  0.2147799E+10

SUMMATION POINT=  0.0000      0.0000      0.0000
```

```
ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =   8687595.
 FY  = -0.1094980E+08
 FZ  =  0.1341054E+08
 MX  = -0.3863355E+10
 MY  = -0.7648162E+10
 MZ  = -0.3741848E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =   8687595.
 FY  = -0.1094980E+08
 FZ  =  0.1341053E+08
 MX  = -0.3863355E+10
 MY  = -0.7648162E+10
 MZ  = -0.3741848E+10

SUMMATION POINT=  0.0000      0.0000      0.0000


*************************************************************************
*************************************************************************
************************* LOAD CASE 13 ********************************


USE LOAD STEP    13  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=    13  SUBSTEP=     1  CUMULATIVE ITERATION=    98
  TIME/FREQUENCY=  13.000
TITLE= Pad, LTSP(2), 20 Casks, 440 Kips N 45 W (Z,X), Soft Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK
```

```
******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  -6222540.
 FY  =   5166400.
 FZ  =  -6222540.
 MX  =  0.1370520E+10
 MY  =  0.4442894E+10
 MZ  =  0.2318289E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1129908E+08
 FY  = -0.1094980E+08
 FZ  =  0.1129908E+08
 MX  = -0.3958592E+10
 MY  = -0.8067543E+10
 MZ  = -0.3859565E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1129908E+08
 FY  = -0.1094980E+08
 FZ  =  0.1129908E+08
 MX  = -0.3958592E+10
 MY  = -0.8067543E+10
 MZ  = -0.3859566E+10

SUMMATION POINT=  0.0000      0.0000      0.0000


*************************************************************************
```

```
*************************************************************************
*************************  LOAD CASE 14 ********************************

USE LOAD STEP    14  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=    14  SUBSTEP=     1  CUMULATIVE ITERATION=   102
  TIME/FREQUENCY=  14.000
TITLE= Pad, LTSP(2), 20 Casks, 440 Kips N 57.03 W (Z,X), Soft Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  -7386160.
 FY  =   5166400.
 FZ  =  -4783800.
 MX  =  0.1541011E+10
 MY  =  0.4477396E+10
 MZ  =  0.2456178E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1341054E+08
 FY  = -0.1094980E+08
 FZ  =   8687595.
 MX  = -0.4076309E+10
 MY  = -0.8129902E+10
 MZ  = -0.3954802E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
```

```
 FX  =  0.1341053E+08
 FY  = -0.1094980E+08
 FZ  =   8687595.
 MX  = -0.4076309E+10
 MY  = -0.8129902E+10
 MZ  = -0.3954802E+10

SUMMATION POINT=  0.0000      0.0000      0.0000


*************************************************************************
*************************************************************************
*************************  LOAD CASE 15 *********************************


USE LOAD STEP    15  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=    15  SUBSTEP=     1  CUMULATIVE ITERATION=   110
  TIME/FREQUENCY=  15.000
TITLE= Pad, LTSP(2), 20 Casks, 440 Kips West (X), Soft Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  -8800000.
 FY  =   5166400.
 FZ  = -0.1477873E-04
 MX  =  0.2107891E+10
 MY  =  0.3590400E+10
 MZ  =  0.2623718E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1598106E+08
 FY  = -0.1094980E+08
 FZ  = -0.1841093E-04
 MX  = -0.4467518E+10
 MY  = -0.6520270E+10
```

```
 MZ  = -0.4070291E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1598105E+08
 FY  = -0.1094980E+08
 FZ  = -0.2896357E-03
 MX  = -0.4467518E+10
 MY  = -0.6520270E+10
 MZ  = -0.4070291E+10

SUMMATION POINT=  0.0000      0.0000      0.0000



*************************************************************************
*************************************************************************
************************* LOAD CASE 16 ********************************


USE LOAD STEP    16  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=    16  SUBSTEP=     1  CUMULATIVE ITERATION=   123
  TIME/FREQUENCY=  16.000
TITLE= Pad, LTSP(2), 20 Casks, 176 Kips North (Z), Max Up, Soft Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.7869293E-05
 FY  =   2116000.
 FZ  =  -3520000.
 MX  =  0.4462080E+09
 MY  =  0.1077120E+10
 MZ  =  0.6474960E+09

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1
```

```
    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  = -0.7864828E-06
 FY  =  -4525750.
 FZ  =   7295275.
 MX  = -0.1599273E+10
 MY  = -0.2232354E+10
 MZ  = -0.1384880E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.3473238E-05
 FY  =  -4525750.
 FZ  =   7295275.
 MX  = -0.1599273E+10
 MY  = -0.2232354E+10
 MZ  = -0.1384880E+10

SUMMATION POINT=  0.0000      0.0000      0.0000


*************************************************************************
*************************************************************************
************************* LOAD CASE 17 ********************************


USE LOAD STEP    17  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=    17  SUBSTEP=     1  CUMULATIVE ITERATION=   136
  TIME/FREQUENCY=  17.000
TITLE= Pad, LTSP(2), 20 Casks, 176 Kips West (X), Max Up, Soft Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK
```

```
******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  -3520000.
 FY  =   2116000.
 FZ  = -0.4083373E-05
 MX  =  0.8633280E+09
 MY  =  0.1436160E+10
 MZ  =  0.1064616E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =   7295275.
 FY  =  -4525750.
 FZ  = -0.1771540E-04
 MX  = -0.1846506E+10
 MY  = -0.2976472E+10
 MZ  = -0.1632112E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =   7295275.
 FY  =  -4525750.
 FZ  = -0.4159231E-04
 MX  = -0.1846506E+10
 MY  = -0.2976472E+10
 MZ  = -0.1632112E+10

SUMMATION POINT=  0.0000      0.0000      0.0000


*************************************************************************
*************************************************************************
```

```
************************* LOAD CASE 18 ********************************

USE LOAD STEP    18  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=    18  SUBSTEP=     1  CUMULATIVE ITERATION=   151
  TIME/FREQUENCY=  18.000
TITLE= Pad, LTSP(4), 20 Casks, 156 Kips North (Z), Max Up, Soft Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  = -0.5957049E-06
 FY  =   1112000.
 FZ  =  -3120000.
 MX  =  0.8397600E+08
 MY  =  0.9547200E+09
 MZ  =  0.3402720E+09

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.8917241E-05
 FY  =  -3521750.
 FZ  =   6895275.
 MX  = -0.1237041E+10
 MY  = -0.2109954E+10
 MZ  = -0.1077656E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.3327496E-05
```

```
 FY  =  -3521750.
 FZ  =   6895275.
 MX  = -0.1237041E+10
 MY  = -0.2109954E+10
 MZ  = -0.1077656E+10

SUMMATION POINT=  0.0000      0.0000      0.0000


*************************************************************************
*************************************************************************
*************************  LOAD CASE 19 *********************************

USE LOAD STEP    19  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=    19  SUBSTEP=     1  CUMULATIVE ITERATION=   168
  TIME/FREQUENCY=  19.000
TITLE= Pad, LTSP(4), 20 Casks, 156 Kips West (X), Max Up, Soft Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  -3120000.
 FY  =   1112000.
 FZ  = -0.1947861E-04
 MX  =  0.4536960E+09
 MY  =  0.1272960E+10
 MZ  =  0.7099920E+09

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =   6895275.
 FY  =  -3521750.
 FZ  =  0.2198764E-04
 MX  = -0.1436874E+10
 MY  = -0.2813272E+10
 MZ  = -0.1277488E+10
```

```
SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =   6895275.
 FY  =  -3521750.
 FZ  = -0.2603334E-04
 MX  = -0.1436874E+10
 MY  = -0.2813272E+10
 MZ  = -0.1277488E+10

SUMMATION POINT=  0.0000      0.0000      0.0000


EXIT THE ANSYS POST1 DATABASE PROCESSOR


***** ROUTINE COMPLETED *****  CP =        60.577


*** NOTE ***                            CP=     60.577   TIME= 09:59:55
A total of 1 warnings and errors written to dcslabs2.err.

/OUTPUT FILE= padhardreac.out
```

Below are the equilibrium results for the hard rock analyses:

```
*************************************************************************
*************************************************************************
*************************************************************************
*************************************************************************
*************************************************************************
*************************************************************************

************************ Hard Rock Reactions ***************************


CURRENT JOBNAME REDEFINED AS dcslabh2

RESUME ANSYS DATA FROM FILE NAME=dcslabh2.db

*** ANSYS GLOBAL STATUS ***

TITLE = Pad, LTSP(4), 20 Casks, 156 Kips West (X), Max Up, Hard Rock
ANALYSIS TYPE =  STATIC (STEADY-STATE)
NUMBER OF ELEMENT TYPES =      6
   1728 ELEMENTS CURRENTLY SELECTED.  MAX ELEMENT NUMBER =    33177
    731 NODES CURRENTLY SELECTED.     MAX NODE NUMBER =       17051
    259 KEYPOINTS CURRENTLY SELECTED. MAX KEYPOINT NUMBER =     259
    250 LINES CURRENTLY SELECTED.     MAX LINE NUMBER =         396
    181 AREAS CURRENTLY SELECTED.     MAX AREA NUMBER =         295
     70 VOLUMES CURRENTLY SELECTED.   MAX VOL. NUMBER =          70
    11 COMPONENTS CURRENTLY DEFINED
MAXIMUM LINEAR PROPERTY NUMBER        =       5
MAXIMUM REAL CONSTANT SET NUMBER      =       6
ACTIVE COORDINATE SYSTEM              =       0  (CARTESIAN)
MAXIMUM CONSTRAINT EQUATION NUMBER    =    4620
NUMBER OF SPECIFIED CONSTRAINTS       =    2193
NUMBER OF NODAL LOADS                 =    2160

INITIAL JOBNAME = dcslabs2
CURRENT JOBNAME = dcslabh2

         ***** ANSYS RESULTS INTERPRETATION (POST1) *****

ENTER  /SHOW,DEVICE-NAME  TO ENABLE GRAPHIC DISPLAY
ENTER  FINISH             TO LEAVE POST1

*************************************************************************
*************************************************************************
*************************  LOAD CASE 1 **********************************


USE LOAD STEP     1  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     1  SUBSTEP=     1  CUMULATIVE ITERATION=     2
  TIME/FREQUENCY=  1.0000
```

```
TITLE= Pad, Gravity, 20 Casks, Hard Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1439743E-05
 FY  =   7200000.
 FZ  =  0.1828341E-04
 MX  =  0.2937600E+10
 MY  = -0.6399110E-02
 MZ  =  0.2203200E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.3232257E-04
 FY  = -0.1523250E+08
 FZ  =  0.3119760E-05
 MX  = -0.6214860E+10
 MY  = -0.7304851E-02
 MZ  = -0.4661145E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  = -0.1708598E-04
 FY  = -0.1523250E+08
 FZ  =  0.1772267E-02
 MX  = -0.6214860E+10
 MY  = -0.5295777
 MZ  = -0.4661145E+10

SUMMATION POINT=  0.0000      0.0000      0.0000
```

```
*************************************************************************
*************************************************************************
*************************  LOAD CASE 2 **********************************

USE LOAD STEP     2  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     2  SUBSTEP=     1  CUMULATIVE ITERATION=    17
  TIME/FREQUENCY=  2.0000
TITLE= Pad, HE(1), 20 Casks, 515 Kips North (Z), Hard Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  = -0.1526141E-04
 FY  =   5340800.
 FZ  = -0.1030000E+08
 MX  =  0.9584964E+09
 MY  =  0.3151800E+10
 MZ  =  0.1634285E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.3748999E-04
 FY  = -0.1176680E+08
 FZ  =  0.1679026E+08
 MX  = -0.3872366E+10
 MY  = -0.5137820E+10
 MZ  = -0.3600641E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY
```

```
******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  = -0.1751846E-03
 FY  = -0.1176680E+08
 FZ  =  0.1679026E+08
 MX  = -0.3872366E+10
 MY  = -0.5137820E+10
 MZ  = -0.3600641E+10

SUMMATION POINT=  0.0000      0.0000      0.0000


*************************************************************************
*************************************************************************
*************************  LOAD CASE 3 ***********************************


USE LOAD STEP     3  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     3  SUBSTEP=     1  CUMULATIVE ITERATION=    30
  TIME/FREQUENCY=  3.0000
TITLE= Pad, HE(1), 20 Casks, 515 Kips N 32.93 W (Z,X), Hard Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  -5599220.
 FY  =   5340800.
 FZ  =  -8645160.
 MX  =  0.1154595E+10
 MY  =  0.4929901E+10
 MZ  =  0.2297792E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =   9125487.
 FY  = -0.1176680E+08
 FZ  =  0.1409120E+08
 MX  = -0.4021475E+10
```

```
 MY  = -0.8035105E+10
 MZ  = -0.4105466E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =   9125488.
 FY  = -0.1176680E+08
 FZ  =  0.1409120E+08
 MX  = -0.4021475E+10
 MY  = -0.8035105E+10
 MZ  = -0.4105466E+10

SUMMATION POINT=  0.0000      0.0000      0.0000


*************************************************************************
*************************************************************************
*************************  LOAD CASE 4 ***********************************


USE LOAD STEP     4  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     4  SUBSTEP=     1  CUMULATIVE ITERATION=    36
  TIME/FREQUENCY=  4.0000
TITLE= Pad, HE(1), 20 Casks, 515 Kips N 45 W (Z,X), Hard Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  -7283200.
 FY  =   5340800.
 FZ  =  -7283200.
 MX  =  0.1315987E+10
 MY  =  0.5200205E+10
 MZ  =  0.2497344E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1
```

```
    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1186976E+08
 FY  = -0.1176680E+08
 FZ  =  0.1186976E+08
 MX  = -0.4144190E+10
 MY  = -0.8475007E+10
 MZ  = -0.4257305E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1186976E+08
 FY  = -0.1176680E+08
 FZ  =  0.1186976E+08
 MX  = -0.4144190E+10
 MY  = -0.8475007E+10
 MZ  = -0.4257305E+10

SUMMATION POINT=  0.0000      0.0000      0.0000


*************************************************************************
*************************************************************************
*************************  LOAD CASE 5 ***********************************


USE LOAD STEP     5  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     5  SUBSTEP=     1  CUMULATIVE ITERATION=    42
  TIME/FREQUENCY=  5.0000
TITLE= Pad, HE(1), 20 Casks, 515 Kips N 57.07 W (Z,X), Hard Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
```

```
 FX  =  -8645160.
 FY  =   5340800.
 FZ  =  -5599220.
 MX  =  0.1515539E+10
 MY  =  0.5240587E+10
 MZ  =  0.2658736E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1409120E+08
 FY  = -0.1176680E+08
 FZ  =   9125487.
 MX  = -0.4296029E+10
 MY  = -0.8541607E+10
 MZ  = -0.4380021E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1409120E+08
 FY  = -0.1176680E+08
 FZ  =   9125488.
 MX  = -0.4296029E+10
 MY  = -0.8541607E+10
 MZ  = -0.4380021E+10

SUMMATION POINT=  0.0000      0.0000      0.0000


*************************************************************************
*************************************************************************
************************  LOAD CASE 6 ***********************************


USE LOAD STEP     6  SUBSTEP     0  FOR LOAD CASE 0
```

```
SET COMMAND GOT LOAD STEP=     6  SUBSTEP=     1  CUMULATIVE ITERATION=    54
  TIME/FREQUENCY=  6.0000
TITLE= Pad, HE(1), 20 Casks, 515 Kips West (W), Hard Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  = -0.1030000E+08
 FY  =   5340800.
 FZ  = -0.2196088E-04
 MX  =  0.2179046E+10
 MY  =  0.4202400E+10
 MZ  =  0.2854835E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1679026E+08
 FY  = -0.1176680E+08
 FZ  = -0.8510353E-05
 MX  = -0.4800854E+10
 MY  = -0.6850426E+10
 MZ  = -0.4529129E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1679026E+08
 FY  = -0.1176680E+08
 FZ  =  0.1542001E-02
 MX  = -0.4800854E+10
 MY  = -0.6850426E+10
 MZ  = -0.4529129E+10
```

```
SUMMATION POINT=  0.0000      0.0000      0.0000

*************************************************************************
*************************************************************************
*************************  LOAD CASE 7 **********************************

USE LOAD STEP     7  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     7  SUBSTEP=     1  CUMULATIVE ITERATION=    74
  TIME/FREQUENCY=  7.0000
TITLE= Pad, HE(1), 20 Casks, 206 Kips North (z), Max Up, Hard Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  = -0.2632530E-06
 FY  =   2552000.
 FZ  =  -4120000.
 MX  =  0.5529960E+09
 MY  =  0.1260720E+10
 MZ  =  0.7809120E+09

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  = -0.7301257E-05
 FY  =  -6568250.
 FZ  =   7525780.
 MX  = -0.2344886E+10
 MY  = -0.2302889E+10
 MZ  = -0.2009884E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.
```

```
SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  = -0.6856447E-05
 FY  =  -6568250.
 FZ  =   7525780.
 MX  = -0.2344886E+10
 MY  = -0.2302889E+10
 MZ  = -0.2009884E+10

SUMMATION POINT=  0.0000      0.0000      0.0000


*************************************************************************
*************************************************************************
*************************  LOAD CASE 8 **********************************


USE LOAD STEP     8  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     8  SUBSTEP=     1  CUMULATIVE ITERATION=    90
  TIME/FREQUENCY=  8.0000
TITLE= Pad, HE(1), 20 Casks, 206 Kips West (X), Max Up, Hard Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  -4120000.
 FY  =   2552000.
 FZ  = -0.1963066E-04
 MX  =  0.1041216E+10
 MY  =  0.1680960E+10
 MZ  =  0.1269132E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =   7525780.
 FY  =  -6568250.
```

```
 FZ  =  0.4820207E-04
 MX  = -0.2679846E+10
 MY  = -0.3070518E+10
 MZ  = -0.2344844E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =   7525780.
 FY  =  -6568250.
 FZ  =  0.6982870E-03
 MX  = -0.2679846E+10
 MY  = -0.3070518E+10
 MZ  = -0.2344844E+10

SUMMATION POINT=  0.0000      0.0000      0.0000


*************************************************************************
*************************************************************************
*************************  LOAD CASE 9 ***********************************


USE LOAD STEP     9  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     9  SUBSTEP=     1  CUMULATIVE ITERATION=    95
  TIME/FREQUENCY=  9.0000
TITLE= Pad, HE(3), 20 Casks, 171.2 Kips North (Z), Max Dn, Hard Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  = -0.2248873E-04
 FY  =  0.1546600E+08
 FZ  =  -3424000.
 MX  =  0.5904384E+10
 MY  =  0.1047744E+10
 MZ  =  0.4732596E+10

SUMMATION POINT=  0.0000      0.0000      0.0000
```

```
ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  = -0.1211335E-03
 FY  = -0.2751475E+08
 FZ  =   6829780.
 MX  = -0.1097353E+11
 MY  = -0.2089913E+10
 MZ  = -0.8419514E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.3307554E-04
 FY  = -0.2751475E+08
 FZ  =   6829780.
 MX  = -0.1097353E+11
 MY  = -0.2089913E+10
 MZ  = -0.8419514E+10

SUMMATION POINT=  0.0000      0.0000      0.0000


*************************************************************************
*************************************************************************
*************************  LOAD CASE 10 *********************************


USE LOAD STEP    10  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=    10  SUBSTEP=     1  CUMULATIVE ITERATION=    99
  TIME/FREQUENCY=  10.000
TITLE= Pad, HE(3), 20 Casks, 171.2 Kips West (X), Max Dn, Hard Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******
```

```
***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  -3424000.
 FY  =  0.1546600E+08
 FZ  =  0.1619331E-04
 MX  =  0.6310128E+10
 MY  =  0.1396992E+10
 MZ  =  0.5138340E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =   6829780.
 FY  = -0.2751475E+08
 FZ  =  0.4556587E-05
 MX  = -0.1122602E+11
 MY  = -0.2786550E+10
 MZ  = -0.8671997E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =   6829780.
 FY  = -0.2751475E+08
 FZ  =  0.3537249E-02
 MX  = -0.1122602E+11
 MY  = -0.2786550E+10
 MZ  = -0.8671997E+10

SUMMATION POINT=  0.0000      0.0000      0.0000


*************************************************************************
*************************************************************************
************************  LOAD CASE 11 ********************************
```

```
USE LOAD STEP    11  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=    11  SUBSTEP=     1  CUMULATIVE ITERATION=   117
  TIME/FREQUENCY=  11.000
TITLE= Pad, LTSP(2), 20 Casks, 440 Kips North (Z), Hard Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  = -0.5597062E-06
 FY  =   5166400.
 FZ  =  -8800000.
 MX  =  0.1065091E+10
 MY  =  0.2692800E+10
 MZ  =  0.1580918E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.2110709E-05
 FY  = -0.1094980E+08
 FZ  =  0.1598106E+08
 MX  = -0.3747866E+10
 MY  = -0.4890203E+10
 MZ  = -0.3350639E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.7050655E-05
 FY  = -0.1094980E+08
 FZ  =  0.1598106E+08
 MX  = -0.3747866E+10
```

```
 MY  = -0.4890203E+10
 MZ  = -0.3350639E+10

SUMMATION POINT=  0.0000      0.0000      0.0000



*************************************************************************
*************************************************************************
*************************  LOAD CASE 12 *********************************


USE LOAD STEP    12  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=    12  SUBSTEP=     1  CUMULATIVE ITERATION=   130
  TIME/FREQUENCY=  12.000
TITLE= Pad, LTSP(2), 20 Casks, 440 Kips N 32.93 W (Z,X), Hard Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  -4783800.
 FY  =   5166400.
 FZ  =  -7386160.
 MX  =  0.1232631E+10
 MY  =  0.4211955E+10
 MZ  =  0.2147799E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =   8687595.
 FY  = -0.1094980E+08
 FZ  =  0.1341054E+08
 MX  = -0.3863355E+10
 MY  = -0.7648162E+10
 MZ  = -0.3741848E+10

SUMMATION POINT=  0.0000      0.0000      0.0000
```

```
ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =   8687595.
 FY  = -0.1094980E+08
 FZ  =  0.1341054E+08
 MX  = -0.3863355E+10
 MY  = -0.7648162E+10
 MZ  = -0.3741848E+10

SUMMATION POINT=  0.0000      0.0000      0.0000



*************************************************************************
*************************************************************************
*************************  LOAD CASE 13 ********************************


USE LOAD STEP    13  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=    13  SUBSTEP=     1  CUMULATIVE ITERATION=   135
  TIME/FREQUENCY=  13.000
TITLE= Pad, LTSP(2), 20 Casks, 440 Kips N 45 W (Z,X), Hard Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  -6222540.
 FY  =   5166400.
 FZ  =  -6222540.
 MX  =  0.1370520E+10
 MY  =  0.4442894E+10
 MZ  =  0.2318289E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE
```

```
******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1129908E+08
 FY  = -0.1094980E+08
 FZ  =  0.1129908E+08
 MX  = -0.3958592E+10
 MY  = -0.8067543E+10
 MZ  = -0.3859565E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1129908E+08
 FY  = -0.1094980E+08
 FZ  =  0.1129908E+08
 MX  = -0.3958592E+10
 MY  = -0.8067543E+10
 MZ  = -0.3859565E+10

SUMMATION POINT=  0.0000      0.0000      0.0000



*************************************************************************
*************************************************************************
*************************  LOAD CASE 14 *********************************


USE LOAD STEP    14  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=    14  SUBSTEP=     1  CUMULATIVE ITERATION=   141
  TIME/FREQUENCY=  14.000
TITLE= Pad, LTSP(2), 20 Casks, 440 Kips N 57.03 W (Z,X), Hard Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  -7386160.
```

```
 FY  =   5166400.
 FZ  =  -4783800.
 MX  =  0.1541011E+10
 MY  =  0.4477396E+10
 MZ  =  0.2456178E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1341054E+08
 FY  = -0.1094980E+08
 FZ  =   8687595.
 MX  = -0.4076309E+10
 MY  = -0.8129902E+10
 MZ  = -0.3954802E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1341054E+08
 FY  = -0.1094980E+08
 FZ  =   8687595.
 MX  = -0.4076309E+10
 MY  = -0.8129902E+10
 MZ  = -0.3954802E+10

SUMMATION POINT=  0.0000      0.0000      0.0000


*************************************************************************
*************************************************************************
************************  LOAD CASE 15 ********************************

USE LOAD STEP    15  SUBSTEP     0  FOR LOAD CASE 0
```

```
SET COMMAND GOT LOAD STEP=     15  SUBSTEP=      1  CUMULATIVE ITERATION=    153
  TIME/FREQUENCY=  15.000
TITLE= Pad, LTSP(2), 20 Casks, 440 Kips West (X), Hard Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  -8800000.
 FY  =   5166400.
 FZ  = -0.2177824E-04
 MX  =  0.2107891E+10
 MY  =  0.3590400E+10
 MZ  =  0.2623718E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1598106E+08
 FY  = -0.1094980E+08
 FZ  = -0.2661966E-04
 MX  = -0.4467518E+10
 MY  = -0.6520270E+10
 MZ  = -0.4070291E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1598106E+08
 FY  = -0.1094980E+08
 FZ  =  0.1420339E-02
 MX  = -0.4467518E+10
 MY  = -0.6520270E+10
```

```
 MZ   = -0.4070291E+10

SUMMATION POINT=  0.0000      0.0000      0.0000



*************************************************************************
*************************************************************************
*************************** LOAD CASE 16 ********************************


USE LOAD STEP    16  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=    16  SUBSTEP=     1  CUMULATIVE ITERATION=   177
  TIME/FREQUENCY=  16.000
TITLE= Pad, LTSP(2), 20 Casks, 176 Kips North (Z), Max Up, Hard Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX   =  0.3341301E-05
 FY   =   2116000.
 FZ   =  -3520000.
 MX   =  0.4462080E+09
 MY   =  0.1077120E+10
 MZ   =  0.6474960E+09

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX   = -0.7359254E-05
 FY   =  -4525750.
 FZ   =   7295275.
 MX   = -0.1599273E+10
 MY   = -0.2232354E+10
 MZ   = -0.1384880E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1
```

```
    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.6542933E-05
 FY  =  -4525750.
 FZ  =   7295275.
 MX  = -0.1599273E+10
 MY  = -0.2232354E+10
 MZ  = -0.1384880E+10

SUMMATION POINT=  0.0000      0.0000      0.0000



*************************************************************************
*************************************************************************
*************************  LOAD CASE 17 *********************************


USE LOAD STEP    17  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=    17  SUBSTEP=     1  CUMULATIVE ITERATION=   202
  TIME/FREQUENCY=  17.000
TITLE= Pad, LTSP(2), 20 Casks, 176 Kips West (X), Max Up, Hard Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  -3520000.
 FY  =   2116000.
 FZ  = -0.7035661E-05
 MX  =  0.8633280E+09
 MY  =  0.1436160E+10
 MZ  =  0.1064616E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE
```

```
******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =   7295275.
 FY  =  -4525750.
 FZ  =  0.8117119E-05
 MX  = -0.1846506E+10
 MY  = -0.2976472E+10
 MZ  = -0.1632112E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =   7295275.
 FY  =  -4525750.
 FZ  =  0.6058743E-03
 MX  = -0.1846506E+10
 MY  = -0.2976472E+10
 MZ  = -0.1632112E+10

SUMMATION POINT=  0.0000      0.0000      0.0000


*************************************************************************
*************************************************************************
*************************  LOAD CASE 18 *********************************


USE LOAD STEP    18  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=    18  SUBSTEP=     1  CUMULATIVE ITERATION=   227
  TIME/FREQUENCY=  18.000
TITLE= Pad, LTSP(4), 20 Casks, 156 Kips North (Z), Max Up, Hard Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.4388800E-05
 FY  =   1112000.
```

```
 FZ  =  -3120000.
 MX  =  0.8397600E+08
 MY  =  0.9547200E+09
 MZ  =  0.3402720E+09

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  = -0.9237206E-06
 FY  =  -3521750.
 FZ  =   6895275.
 MX  = -0.1237041E+10
 MY  = -0.2109954E+10
 MZ  = -0.1077656E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.3516802E-05
 FY  =  -3521750.
 FZ  =   6895275.
 MX  = -0.1237041E+10
 MY  = -0.2109954E+10
 MZ  = -0.1077656E+10

SUMMATION POINT=  0.0000      0.0000      0.0000


*************************************************************************
*************************************************************************
************************* LOAD CASE 19 ***********************************


USE LOAD STEP    19  SUBSTEP     0  FOR LOAD CASE 0
```

```
SET COMMAND GOT LOAD STEP=     19  SUBSTEP=      1  CUMULATIVE ITERATION=    252
  TIME/FREQUENCY=  19.000
TITLE= Pad, LTSP(4), 20 Casks, 156 Kips West (X), Max Up, Hard Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  -3120000.
 FY  =   1112000.
 FZ  =  0.6309252E-05
 MX  =  0.4536960E+09
 MY  =  0.1272960E+10
 MZ  =  0.7099920E+09

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =   6895275.
 FY  =  -3521750.
 FZ  =  0.2872058E-05
 MX  = -0.1436874E+10
 MY  = -0.2813272E+10
 MZ  = -0.1277488E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =   6895275.
 FY  =  -3521750.
 FZ  =  0.4402276E-03
 MX  = -0.1436874E+10
 MY  = -0.2813272E+10
 MZ  = -0.1277488E+10
```

```
SUMMATION POINT=  0.0000      0.0000      0.0000


EXIT THE ANSYS POST1 DATABASE PROCESSOR

***** ROUTINE COMPLETED *****  CP =       117.849


*** NOTE ***                            CP=    117.849   TIME= 10:01:13
A total of 1 warnings and errors written to dcslabs2.err.
```

Below is the file that scans the ANSYS database for the applied forces, the forces at the pad/rock interface and the boundary forces on the rock. It creates an output file for the very hard rock model.

```
/com,
/com, This routine processes load results data for the
/com,   evaluation of equilibrium.
/com
/com,   Very Hard Rock Load Step Results
/com
/output,padVhardreac,out
/com
/com ***************************************************************************
/com ***************************************************************************
/com ***************************************************************************
/com ***************************************************************************
/com ***************************************************************************
/com ***************************************************************************
/com
/com ******************* Very Hard Rock Reactions ****************************
/com
/file,dcslabh6
resume
/header,on,off,off,off,on,off
/post1
/com
/com ***************************************************************************
/com ***************************************************************************
/com *************************  LOAD CASE 1 ***********************************
set,1
eall
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com ***************************************************************************
/com ***************************************************************************
/com *************************  LOAD CASE 2 ***********************************
set,2
eall
cmsel,s,cask
```

```
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com ************************************************************************
/com ************************************************************************
/com *************************  LOAD CASE 3 ***********************************
set,3
eall
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com ************************************************************************
/com ************************************************************************
/com *************************  LOAD CASE 4 ***********************************
set,4
eall
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
/com
cmsel,s,boundary
```

```
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com ***************************************************************************
/com ***************************************************************************
/com *************************  LOAD CASE 5 ***********************************
set,5
eall
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com ***************************************************************************
/com ***************************************************************************
/com *************************  LOAD CASE 6 ***********************************
set,6
eall
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com ***************************************************************************
/com ***************************************************************************
/com *************************  LOAD CASE 7 ***********************************
set,7
eall
cmsel,s,cask
/com
```

```
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com ***************************************************************************
/com ***************************************************************************
/com *************************  LOAD CASE 8 ***********************************
set,8
eall
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com ***************************************************************************
/com ***************************************************************************
/com *************************  LOAD CASE 9 ***********************************
set,9
eall
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
```

```
fsum
/com
/com
/com ***************************************************************************
/com ***************************************************************************
/com *************************  LOAD CASE 10 ********************************
set,10
eall
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com ***************************************************************************
/com ***************************************************************************
/com *************************  LOAD CASE 11 ********************************
set,11
eallr
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com
/com
/com ***************************************************************************
/com ***************************************************************************
/com *************************  LOAD CASE 12 ********************************
set,12
eallr
cmsel,s,cask
```

```
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com
/com
/com ************************************************************************
/com ************************************************************************
/com *************************  LOAD CASE 13 ********************************
set,13
eallr
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com
/com
/com ************************************************************************
/com ************************************************************************
/com *************************  LOAD CASE 14 ********************************
set,14
eallr
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
```

```
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com
/com
/com ***************************************************************************
/com ***************************************************************************
/com *************************  LOAD CASE 15 ********************************
set,15
eallr
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com
/com
/com ***************************************************************************
/com ***************************************************************************
/com *************************  LOAD CASE 16 ********************************
set,16
eallr
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
```

```
/com
/com
/com
/com ************************************************************************
/com ************************************************************************
/com *************************  LOAD CASE 17 ********************************
set,17
eallr
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com
/com
/com ************************************************************************
/com ************************************************************************
/com *************************  LOAD CASE 18 ********************************
set,18
eallr
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
/com
/com
/com ************************************************************************
/com ************************************************************************
/com *************************  LOAD CASE 19 ********************************
set,19
```

```
eallr
cmsel,s,cask
/com
/com ******** SUM OF LOADS APPLIED TO CASKS *******
fsum
esel,type,1
cmsel,s,base
/com
/com ******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******
fsum
esel,type,2
cmsel,s,boundary
/com
/com ******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******
fsum
/com
/com
finish
/output
/exit
```

Below are the equilibrium results for the very hard rock analyses:

```
*************************************************************************
*************************************************************************
*************************************************************************
*************************************************************************
*************************************************************************
*************************************************************************

******************* Very Hard Rock Reactions ****************************


CURRENT JOBNAME REDEFINED AS dcslabh6

RESUME ANSYS DATA FROM FILE NAME=dcslabh6.db

*** ANSYS GLOBAL STATUS ***

TITLE = Pad, LTSP(4), 20 Casks, 156 Kips West (X), Max Up, Very Hard Rock
ANALYSIS TYPE =  STATIC (STEADY-STATE)
NUMBER OF ELEMENT TYPES =       6
  15348 ELEMENTS CURRENTLY SELECTED.  MAX ELEMENT NUMBER =    33177
  17051 NODES CURRENTLY SELECTED.     MAX NODE NUMBER =       17051
    259 KEYPOINTS CURRENTLY SELECTED. MAX KEYPOINT NUMBER =     259
    250 LINES CURRENTLY SELECTED.     MAX LINE NUMBER =         396
    181 AREAS CURRENTLY SELECTED.     MAX AREA NUMBER =         295
     70 VOLUMES CURRENTLY SELECTED.   MAX VOL. NUMBER =          70
    11 COMPONENTS CURRENTLY DEFINED
MAXIMUM LINEAR PROPERTY NUMBER        =       5
MAXIMUM REAL CONSTANT SET NUMBER      =       6
ACTIVE COORDINATE SYSTEM              =       0  (CARTESIAN)
MAXIMUM CONSTRAINT EQUATION NUMBER    =    4620
NUMBER OF SPECIFIED CONSTRAINTS       =    2193
NUMBER OF NODAL LOADS                 =    2160

INITIAL JOBNAME = dcslabh6
CURRENT JOBNAME = dcslabh6


PRINT HEADER
DO NOT PRINT SUBTITLE(S)
DO NOT PRINT LOAD STEP ID
DO NOT PRINT NOTE LINE(S)
PRINT COLUMN HEADER LABELS
DO NOT PRINT REPORT TOTALS

***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 5.7     *****
ANSYS/Structural U
00150104          VERSION=INTEL NT      10:24:07  MAY 21, 2001 CP=      3.715

Pad, LTSP(4), 20 Casks, 156 Kips West (X), Max Up, Very Hard Rock
```

```
          ***** ANSYS RESULTS INTERPRETATION (POST1) *****

ENTER  /SHOW,DEVICE-NAME  TO ENABLE GRAPHIC DISPLAY
ENTER  FINISH             TO LEAVE POST1

*** NOTE ***                            CP=      3.715   TIME= 10:24:08
Reading results into the database (SET command) will update the current
 displacement and force boundary conditions in the database with the
 values from the results file for that load set.  Note that any
 subsequent solutions will use these values unless action is taken to
 either SAVE the current values or not overwrite them (/EXIT,NOSAVE).

***********************************************************************
***********************************************************************
*************************  LOAD CASE 1 *********************************


USE LOAD STEP     1  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     1  SUBSTEP=     1  CUMULATIVE ITERATION=     2
  TIME/FREQUENCY=  1.0000
TITLE= Pad, Gravity, 20 Casks, Very Hard Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  = -0.4523999E-06
 FY  =   7200000.
 FZ  =  0.6547146E-05
 MX  =  0.2937600E+10
 MY  = -0.2844520E-02
 MZ  =  0.2203200E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.3108630E-06
 FY  = -0.1523243E+08
 FZ  =  0.3531967E-05
 MX  = -0.6214830E+10
```

```
 MY   =  0.1567539E-02
 MZ   = -0.4661122E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX   = -0.9449781E-05
 FY   = -0.1523243E+08
 FZ   =  0.1800393E-02
 MX   = -0.6214830E+10
 MY   = -0.5543061
 MZ   = -0.4661122E+10

SUMMATION POINT=  0.0000      0.0000      0.0000


*************************************************************************
*************************************************************************
*************************  LOAD CASE 2 **********************************


USE LOAD STEP     2  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     2  SUBSTEP=     1  CUMULATIVE ITERATION=    17
  TIME/FREQUENCY=  2.0000
TITLE= Pad, HE(1), 20 Casks, 515 Kips North (Z), Very Hard Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX   = -0.4793505E-05
 FY   =   5340800.
 FZ   = -0.1030000E+08
 MX   =  0.9584964E+09
 MY   =  0.3151800E+10
 MZ   =  0.1634285E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1
```

```
    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1310626E-04
 FY  = -0.1176674E+08
 FZ  =  0.1679020E+08
 MX  = -0.3872339E+10
 MY  = -0.5137801E+10
 MZ  = -0.3600623E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  = -0.2226389E-04
 FY  = -0.1176674E+08
 FZ  =  0.1679020E+08
 MX  = -0.3872339E+10
 MY  = -0.5137801E+10
 MZ  = -0.3600623E+10

SUMMATION POINT=  0.0000      0.0000      0.0000


*************************************************************************
*************************************************************************
*************************  LOAD CASE 3 ***********************************


USE LOAD STEP     3  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     3  SUBSTEP=     1  CUMULATIVE ITERATION=    32
  TIME/FREQUENCY=  3.0000
TITLE= Pad, HE(1), 20 Casks, 515 Kips N 32.93 W (Z,X), Very Hard Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
```

```
 FX  =  -5599220.
 FY  =   5340800.
 FZ  =  -8645160.
 MX  =  0.1154595E+10
 MY  =  0.4929901E+10
 MZ  =  0.2297792E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =   9125455.
 FY  = -0.1176674E+08
 FZ  =  0.1409115E+08
 MX  = -0.4021448E+10
 MY  = -0.8035076E+10
 MZ  = -0.4105450E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =   9125455.
 FY  = -0.1176674E+08
 FZ  =  0.1409115E+08
 MX  = -0.4021448E+10
 MY  = -0.8035076E+10
 MZ  = -0.4105450E+10

SUMMATION POINT=  0.0000      0.0000      0.0000


*************************************************************************
*************************************************************************
************************  LOAD CASE 4 ***********************************


USE LOAD STEP     4  SUBSTEP     0  FOR LOAD CASE 0
```

```
SET COMMAND GOT LOAD STEP=      4  SUBSTEP=      1  CUMULATIVE ITERATION=     39
  TIME/FREQUENCY=  4.0000
TITLE= Pad, HE(1), 20 Casks, 515 Kips N 45 W (Z,X), Very Hard Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  -7283200.
 FY  =   5340800.
 FZ  =  -7283200.
 MX  =  0.1315987E+10
 MY  =  0.5200205E+10
 MZ  =  0.2497344E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1186972E+08
 FY  = -0.1176674E+08
 FZ  =  0.1186972E+08
 MX  = -0.4144164E+10
 MY  = -0.8474977E+10
 MZ  = -0.4257289E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.


SELECT      COMPONENT BOUNDARY
******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1186972E+08
 FY  = -0.1176674E+08
 FZ  =  0.1186972E+08
 MX  = -0.4144164E+10
 MY  = -0.8474977E+10
 MZ  = -0.4257289E+10
```

```
SUMMATION POINT=  0.0000      0.0000      0.0000

*************************************************************************
*************************************************************************
*************************  LOAD CASE 5  *********************************

USE LOAD STEP     5  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     5  SUBSTEP=     1  CUMULATIVE ITERATION=    46
  TIME/FREQUENCY=  5.0000
TITLE= Pad, HE(1), 20 Casks, 515 Kips N 57.07 W (Z,X), Very Hard Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  -8645160.
 FY  =   5340800.
 FZ  =  -5599220.
 MX  =  0.1515539E+10
 MY  =  0.5240587E+10
 MZ  =  0.2658736E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1409115E+08
 FY  = -0.1176674E+08
 FZ  =   9125455.
 MX  = -0.4296003E+10
 MY  = -0.8541576E+10
 MZ  = -0.4380005E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.
```

```
SELECT       COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1409115E+08
 FY  = -0.1176674E+08
 FZ  =   9125455.
 MX  = -0.4296003E+10
 MY  = -0.8541576E+10
 MZ  = -0.4380005E+10

SUMMATION POINT=  0.0000      0.0000      0.0000


*************************************************************************
*************************************************************************
*************************  LOAD CASE 6 ***********************************


USE LOAD STEP     6  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     6  SUBSTEP=     1  CUMULATIVE ITERATION=    58
  TIME/FREQUENCY=  6.0000
TITLE= Pad, HE(1), 20 Casks, 515 Kips West (W), Very Hard Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT       COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  = -0.1030000E+08
 FY  =   5340800.
 FZ  = -0.1421130E-04
 MX  =  0.2179046E+10
 MY  =  0.4202400E+10
 MZ  =  0.2854835E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT       COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1679020E+08
 FY  = -0.1176674E+08
```

```
 FZ  = -0.1173427E-04
 MX  = -0.4800830E+10
 MY  = -0.6850402E+10
 MZ  = -0.4529114E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1679020E+08
 FY  = -0.1176674E+08
 FZ  =  0.2145686E-02
 MX  = -0.4800830E+10
 MY  = -0.6850402E+10
 MZ  = -0.4529114E+10

SUMMATION POINT=  0.0000      0.0000      0.0000


*************************************************************************
*************************************************************************
*************************  LOAD CASE 7 ***********************************


USE LOAD STEP     7  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     7  SUBSTEP=     1  CUMULATIVE ITERATION=    80
  TIME/FREQUENCY=  7.0000
TITLE= Pad, HE(1), 20 Casks, 206 Kips North (z), Max Up, Very Hard Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  = -0.1071694E-05
 FY  =   2552000.
 FZ  =  -4120000.
 MX  =  0.5529960E+09
 MY  =  0.1260720E+10
 MZ  =  0.7809120E+09

SUMMATION POINT=  0.0000      0.0000      0.0000
```

```
ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.8723953E-05
 FY  =  -6568213.
 FZ  =   7525749.
 MX  = -0.2344870E+10
 MY  = -0.2302879E+10
 MZ  = -0.2009873E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.4054386E-05
 FY  =  -6568213.
 FZ  =   7525749.
 MX  = -0.2344870E+10
 MY  = -0.2302879E+10
 MZ  = -0.2009873E+10

SUMMATION POINT=  0.0000      0.0000      0.0000


*************************************************************************
*************************************************************************
*************************  LOAD CASE 8 ***********************************


USE LOAD STEP     8  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     8  SUBSTEP=     1  CUMULATIVE ITERATION=    99
  TIME/FREQUENCY=  8.0000
TITLE= Pad, HE(1), 20 Casks, 206 Kips West (X), Max Up, Very Hard Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******
```

```
***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  -4120000.
 FY  =   2552000.
 FZ  = -0.9059058E-06
 MX  =  0.1041216E+10
 MY  =  0.1680960E+10
 MZ  =  0.1269132E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =   7525749.
 FY  =  -6568213.
 FZ  = -0.4264995E-05
 MX  = -0.2679831E+10
 MY  = -0.3070506E+10
 MZ  = -0.2344835E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =   7525749.
 FY  =  -6568213.
 FZ  =  0.8628212E-03
 MX  = -0.2679831E+10
 MY  = -0.3070506E+10
 MZ  = -0.2344835E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

***********************************************************************
***********************************************************************
************************  LOAD CASE 9 ********************************
```

```
USE LOAD STEP     9  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=     9  SUBSTEP=     1  CUMULATIVE ITERATION=   103
  TIME/FREQUENCY=  9.0000
TITLE= Pad, HE(3), 20 Casks, 171.2 Kips North (Z), Max Dn, Very Hard Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.4917512E-05
 FY  =  0.1546600E+08
 FZ  =  -3424000.
 MX  =  0.5904384E+10
 MY  =  0.1047744E+10
 MZ  =  0.4732596E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  = -0.8818270E-06
 FY  = -0.2751464E+08
 FZ  =   6829749.
 MX  = -0.1097349E+11
 MY  = -0.2089903E+10
 MZ  = -0.8419480E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.3975468E-04
 FY  = -0.2751464E+08
 FZ  =   6829749.
 MX  = -0.1097349E+11
```

```
 MY  = -0.2089903E+10
 MZ  = -0.8419480E+10

SUMMATION POINT=  0.0000      0.0000      0.0000


*************************************************************************
*************************************************************************
*************************** LOAD CASE 10 ********************************


USE LOAD STEP    10  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=    10  SUBSTEP=     1  CUMULATIVE ITERATION=   106
  TIME/FREQUENCY=  10.000
TITLE= Pad, HE(3), 20 Casks, 171.2 Kips West (X), Max Dn, Very Hard Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  -3424000.
 FY  =  0.1546600E+08
 FZ  =  0.2985945E-04
 MX  =  0.6310128E+10
 MY  =  0.1396992E+10
 MZ  =  0.5138340E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =   6829749.
 FY  = -0.2751464E+08
 FZ  =  0.8500502E-04
 MX  = -0.1122597E+11
 MY  = -0.2786538E+10
 MZ  = -0.8671965E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1
```

```
    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =   6829749.
 FY  = -0.2751464E+08
 FZ  =  0.3625424E-02
 MX  = -0.1122597E+11
 MY  = -0.2786538E+10
 MZ  = -0.8671965E+10

SUMMATION POINT=  0.0000      0.0000      0.0000


*****************************************************************************
*****************************************************************************
*************************  LOAD CASE 11 ********************************


USE LOAD STEP    11  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=    11  SUBSTEP=     1  CUMULATIVE ITERATION=   122
  TIME/FREQUENCY=  11.000
TITLE= Pad, LTSP(2), 20 Casks, 440 Kips North (Z), Very Hard Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  = -0.5726638E-06
 FY  =   5166400.
 FZ  =  -8800000.
 MX  =  0.1065091E+10
 MY  =  0.2692800E+10
 MZ  =  0.1580918E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
```

```
 FX  =  0.4688000E-05
 FY  = -0.1094975E+08
 FZ  =  0.1598099E+08
 MX  = -0.3747841E+10
 MY  = -0.4890183E+10
 MZ  = -0.3350623E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  = -0.1506593E-04
 FY  = -0.1094975E+08
 FZ  =  0.1598099E+08
 MX  = -0.3747841E+10
 MY  = -0.4890183E+10
 MZ  = -0.3350623E+10

SUMMATION POINT=  0.0000      0.0000      0.0000



*************************************************************************
*************************************************************************
*************************  LOAD CASE 12 *********************************


USE LOAD STEP    12  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=    12  SUBSTEP=     1  CUMULATIVE ITERATION=   136
  TIME/FREQUENCY=  12.000
TITLE= Pad, LTSP(2), 20 Casks, 440 Kips N 32.93 W (Z,X), Very Hard Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  -4783800.
 FY  =   5166400.
 FZ  =  -7386160.
 MX  =  0.1232631E+10
 MY  =  0.4211955E+10
```

```
 MZ   =   0.2147799E+10

SUMMATION POINT=  0.0000       0.0000       0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX   =    8687559.
 FY   = -0.1094975E+08
 FZ   =  0.1341048E+08
 MX   = -0.3863331E+10
 MY   = -0.7648131E+10
 MZ   = -0.3741834E+10

SUMMATION POINT=  0.0000       0.0000       0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX   =    8687559.
 FY   = -0.1094975E+08
 FZ   =  0.1341048E+08
 MX   = -0.3863331E+10
 MY   = -0.7648131E+10
 MZ   = -0.3741834E+10

SUMMATION POINT=  0.0000       0.0000       0.0000


*************************************************************************
*************************************************************************
*************************  LOAD CASE 13  ********************************


USE LOAD STEP    13  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=    13  SUBSTEP=     1  CUMULATIVE ITERATION=   142
  TIME/FREQUENCY=  13.000
TITLE= Pad, LTSP(2), 20 Casks, 440 Kips N 45 W (Z,X), Very Hard Rock
```

```
   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  -6222540.
 FY  =   5166400.
 FZ  =  -6222540.
 MX  =  0.1370520E+10
 MY  =  0.4442894E+10
 MZ  =  0.2318289E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1129903E+08
 FY  = -0.1094975E+08
 FZ  =  0.1129903E+08
 MX  = -0.3958568E+10
 MY  = -0.8067510E+10
 MZ  = -0.3859551E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1129903E+08
 FY  = -0.1094975E+08
 FZ  =  0.1129903E+08
 MX  = -0.3958568E+10
 MY  = -0.8067510E+10
 MZ  = -0.3859551E+10

SUMMATION POINT=  0.0000      0.0000      0.0000
```

```
*************************************************************************
*************************************************************************
*************************  LOAD CASE 14 ********************************

USE LOAD STEP    14  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=    14  SUBSTEP=     1  CUMULATIVE ITERATION=   149
  TIME/FREQUENCY=  14.000
TITLE= Pad, LTSP(2), 20 Casks, 440 Kips N 57.03 W (Z,X), Very Hard Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  -7386160.
 FY  =   5166400.
 FZ  =  -4783800.
 MX  =  0.1541011E+10
 MY  =  0.4477396E+10
 MZ  =  0.2456178E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1341048E+08
 FY  = -0.1094975E+08
 FZ  =   8687559.
 MX  = -0.4076286E+10
 MY  = -0.8129869E+10
 MZ  = -0.3954788E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY
```

```
******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1341048E+08
 FY  = -0.1094975E+08
 FZ  =   8687559.
 MX  = -0.4076286E+10
 MY  = -0.8129869E+10
 MZ  = -0.3954788E+10

SUMMATION POINT=  0.0000      0.0000      0.0000



*************************************************************************
*************************************************************************
*************************  LOAD CASE 15 *********************************


USE LOAD STEP    15  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=    15  SUBSTEP=     1  CUMULATIVE ITERATION=   161
  TIME/FREQUENCY=  15.000
TITLE= Pad, LTSP(2), 20 Casks, 440 Kips West (X), Very Hard Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  -8800000.
 FY  =   5166400.
 FZ  = -0.1613459E-04
 MX  =  0.2107891E+10
 MY  =  0.3590400E+10
 MZ  =  0.2623718E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1598099E+08
```

```
 FY  = -0.1094975E+08
 FZ  =  0.1660914E-05
 MX  = -0.4467497E+10
 MY  = -0.6520244E+10
 MZ  = -0.4070278E+10

SUMMATION POINT=  0.0000       0.0000       0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1598099E+08
 FY  = -0.1094975E+08
 FZ  =  0.1887952E-02
 MX  = -0.4467497E+10
 MY  = -0.6520244E+10
 MZ  = -0.4070278E+10

SUMMATION POINT=  0.0000       0.0000       0.0000


*************************************************************************
*************************************************************************
*************************  LOAD CASE 16 ********************************


USE LOAD STEP    16  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=    16  SUBSTEP=     1  CUMULATIVE ITERATION=   186
  TIME/FREQUENCY=  16.000
TITLE= Pad, LTSP(2), 20 Casks, 176 Kips North (Z), Max Up, Very Hard Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  = -0.1374787E-05
 FY  =   2116000.
 FZ  =  -3520000.
 MX  =  0.4462080E+09
 MY  =  0.1077120E+10
 MZ  =  0.6474960E+09
```

```
SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  = -0.2897133E-05
 FY  =  -4525728.
 FZ  =   7295240.
 MX  = -0.1599263E+10
 MY  = -0.2232344E+10
 MZ  = -0.1384873E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.1488263E-04
 FY  =  -4525728.
 FZ  =   7295240.
 MX  = -0.1599263E+10
 MY  = -0.2232344E+10
 MZ  = -0.1384873E+10

SUMMATION POINT=  0.0000      0.0000      0.0000


*************************************************************************
*************************************************************************
*************************  LOAD CASE 17 *********************************


USE LOAD STEP    17  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=    17  SUBSTEP=     3  CUMULATIVE ITERATION=   257
  TIME/FREQUENCY=  17.000
TITLE= Pad, LTSP(2), 20 Casks, 176 Kips West (X), Max Up, Very Hard Rock
```

```
   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  -3520000.
 FY  =   2116000.
 FZ  =  0.1903091E-05
 MX  =  0.8633280E+09
 MY  =  0.1436160E+10
 MZ  =  0.1064616E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =   7295240.
 FY  =  -4525728.
 FZ  = -0.3084061E-05
 MX  = -0.1846497E+10
 MY  = -0.2976458E+10
 MZ  = -0.1632107E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =   7295240.
 FY  =  -4525728.
 FZ  =  0.8454346E-03
 MX  = -0.1846497E+10
 MY  = -0.2976458E+10
 MZ  = -0.1632107E+10

SUMMATION POINT=  0.0000      0.0000      0.0000
```

```
*************************************************************************
*************************************************************************
*************************  LOAD CASE 18 ********************************

USE LOAD STEP    18  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=    18  SUBSTEP=     3  CUMULATIVE ITERATION=   338
  TIME/FREQUENCY=  18.000
TITLE= Pad, LTSP(4), 20 Casks, 156 Kips North (Z), Max Up, Very Hard Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  = -0.1091942E-05
 FY  =   1112000.
 FZ  =  -3120000.
 MX  =  0.8397600E+08
 MY  =  0.9547200E+09
 MZ  =  0.3402720E+09

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  = -0.8082296E-06
 FY  =  -3521728.
 FZ  =   6895240.
 MX  = -0.1237031E+10
 MY  = -0.2109944E+10
 MZ  = -0.1077649E+10

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY
```

```
******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  0.2689891E-05
 FY  =  -3521728.
 FZ  =   6895240.
 MX  = -0.1237031E+10
 MY  = -0.2109944E+10
 MZ  = -0.1077649E+10

SUMMATION POINT=  0.0000      0.0000      0.0000



*************************************************************************
*************************************************************************
*************************  LOAD CASE 19 *********************************

USE LOAD STEP    19  SUBSTEP     0  FOR LOAD CASE 0

SET COMMAND GOT LOAD STEP=    19  SUBSTEP=     3  CUMULATIVE ITERATION=   412
  TIME/FREQUENCY=  19.000
TITLE= Pad, LTSP(4), 20 Casks, 156 Kips West (X), Max Up, Very Hard Rock

   15348  ELEMENTS (OF    15348  DEFINED) SELECTED BY  EALL  COMMAND.

SELECT      COMPONENT CASK

******** SUM OF LOADS APPLIED TO CASKS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =  -3120000.
 FY  =   1112000.
 FZ  = -0.4946492E-05
 MX  =  0.4536960E+09
 MY  =  0.1272960E+10
 MZ  =  0.7099920E+09

SUMMATION POINT=  0.0000      0.0000      0.0000

ESEL  FOR LABEL= TYPE  FROM     1 TO     1 BY    1

    9056  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BASE

******** LOADS TRANSMITTED THRU CONCRETE/ROCK INTERFACE *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX  =   6895240.
 FY  =  -3521728.
```

```
 FZ   =  0.5138243E-05
 MX   = -0.1436865E+10
 MY   = -0.2813258E+10
 MZ   = -0.1277483E+10

SUMMATION POINT=  0.0000       0.0000       0.0000

ESEL  FOR LABEL= TYPE  FROM     2 TO     2 BY    1

    1728  ELEMENTS (OF    15348  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      COMPONENT BOUNDARY

******** LOADS REACTED AT ROCK BOUNDARY CONSTRAINTS *******

***** SUMMATION OF TOTAL    FORCES AND MOMENTS IN GLOBAL COORDINATES *****
 FX   =   6895240.
 FY   =  -3521728.
 FZ   =  0.6295661E-03
 MX   = -0.1436865E+10
 MY   = -0.2813258E+10
 MZ   = -0.1277483E+10

SUMMATION POINT=  0.0000       0.0000       0.0000


EXIT THE ANSYS POST1 DATABASE PROCESSOR


***** ROUTINE COMPLETED *****  CP =        60.427


*** NOTE ***                            CP=      60.427   TIME= 10:25:30
A total of 2 warnings and errors written to dcslabh6.err.
```