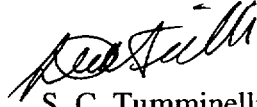




Originator:  S. C. Tumminelli
Date: November 30, 2001

Appendix LT-1

Analyses for Adjusted LTSP Horizontal Loads

This Appendix presents analyses for adjusted LTSP horizontal loads.

Appendix Contents

DISCUSSION AND CONCLUSIONS	sheet 2
EQUILIBRIUM	
Expected reactions	sheet 3
ANSYS input file for reactions	sheet 5
ANSYS output file for reactions	sheet 8
PAD DISPLACEMENTS	
ANSYS input file for displacements	sheet 16
ANSYS output file for displacements	sheet 18
CASK DISPLACEMENTS	
ANSYS input file for cask displacements	sheet 24
ANSYS output file for cask displacements	sheet 26
PAD X and Z STRESSES	
ANSYS input file for pad X and Z stresses	sheet 33
ANSYS output file for pad X and Z stresses	sheet 38
PAD PRINCIPAL STRESSES	
ANSYS input file for pad principal stresses	sheet 51
ANSYS output file for pad principal stresses	sheet 54

**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	σ_X Max	σ_X Min	σ_Z Max	σ_Z Min	σ_1 Max	σ_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 $68 \times 105 \times 7.5 \times 0.15 = 8032.5$ Kip

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

Sum of Applied Loads

$$\begin{aligned} F_x &= 0 \\ F_y &= 258320 \times 20 = 5166400 \\ F_z &= 1.05 \times 440000 \times 20 = 9240000 \end{aligned}$$

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

$$\begin{aligned} F_x &= 0 \\ F_y &= 258320 \times 20 + 0.720 \times 8032500 = 10949800 \\ F_z &= 1.05 \times 440000 \times 20 + 0.894 \times 8032500 = 16421055 \end{aligned}$$

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

Sum of Applied Loads

$$\begin{aligned} F_x &= 1.05 \times 239190 \times 20 = 5022990 \\ F_y &= 258320 \times 20 = 5166400 \\ F_z &= 1.05 \times 369308 \times 20 = 7755468 \end{aligned}$$

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

$$\begin{aligned} F_x &= 1.05 \times 239190 \times 20 + 0.486 \times 8032500 = 8926785 \\ F_y &= 258320 \times 20 + 0.720 \times 8032500 = 10949800 \\ F_z &= 1.05 \times 369308 \times 20 + 0.750 \times 8032500 = 13779843 \end{aligned}$$

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

Sum of Applied Loads

$$\begin{aligned} F_x &= 1.05 \times 311127 \times 20 = 6533667 \\ F_y &= 258320 \times 20 = 5166400 \\ F_z &= 1.05 \times 311127 \times 20 = 6533667 \end{aligned}$$

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



$$\begin{aligned}F_x &= 1.05 * 311127 * 20 + 0.632 * 8032500 &= 11610207 \\F_y &= 258320 * 20 + 0.720 * 8032500 &= 10949800 \\F_z &= 1.05 * 311127 * 20 + 0.632 * 8032500 &= 11610207\end{aligned}$$

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

Sum of Applied Loads

$$\begin{aligned}F_x &= 1.05 * 369308 * 20 = 7755468 \\F_y &= 258320 * 20 = 5166400 \\F_z &= 1.05 * 239190 * 20 = 5022990\end{aligned}$$

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

$$\begin{aligned}F_x &= 1.05 * 369308 * 20 + 0.750 * 8032500 &= 13779843 \\F_y &= 258320 * 20 + 0.720 * 8032500 &= 10949800 \\F_z &= 1.05 * 239190 * 20 + 0.486 * 8032500 &= 8926785\end{aligned}$$

Load Step 5 - Apply in the West direction:

Sum of Applied Loads

$$\begin{aligned}F_x &= 1.05 * 440000 * 20 = 9240000 \\F_y &= 258320 * 20 = 5166400 \\F_z &= 0\end{aligned}$$

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

$$\begin{aligned}F_x &= 1.05 * 440000 * 20 + 0.894 * 8032500 &= 16421055 \\F_y &= 258320 * 20 + 0.720 * 8032500 &= 10949800 \\F_z &= 0\end{aligned}$$



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Appendix LT-1 to Calculation PGE-009-CALC-003

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 *****

```

Appendix LT-1 to Calculation PGE-009-CALC-003

```
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
```

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```
/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
```


Appendix LT-1 to Calculation PGE-009-CALC-003

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



Appendix LT-1 to Calculation PGE-009-CALC-003

***** 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

C
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



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Appendix LT-1 to Calculation PGE-009-CALC-003

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



Appendix LT-1 to Calculation PGE-009-CALC-003

```
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 *****
```



Appendix LT-1 to Calculation PGE-009-CALC-003

***** 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



Appendix LT-1 to Calculation PGE-009-CALC-003

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



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Appendix LT-1 to Calculation PGE-009-CALC-003

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
```




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Appendix LT-1 to Calculation PGE-009-CALC-003

```

/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

Appendix LT-1 to Calculation PGE-009-CALC-003

***** 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



Appendix LT-1 to Calculation PGE-009-CALC-003

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

=====



Appendix LT-1 to Calculation PGE-009-CALC-003

===== 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



Appendix LT-1 to Calculation PGE-009-CALC-003

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.



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Appendix LT-1 to Calculation PGE-009-CALC-003

=====

===== 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
nset,node,159
nset,node,3022
nset,node,3735
nset,node,4467
nset,node,5178
nset,node,5890
nset,node,6602
nset,node,8183
nset,node,11046
nset,node,11759
nset,node,12491
nset,node,13202
nset,node,13914
nset,node,14626
/COM
=====
/COM
=====
/COM ===== SET 1
=====
set,1
nsort,u,y
prdi
/COM
=====
/COM
=====
```




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Appendix LT-1 to Calculation PGE-009-CALC-003

/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



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Appendix LT-1 to Calculation PGE-009-CALC-003

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



Appendix LT-1 to Calculation PGE-009-CALC-003

```
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
```



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Appendix LT-1 to Calculation PGE-009-CALC-003

```
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

Appendix LT-1 to Calculation PGE-009-CALC-003

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



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Appendix LT-1 to Calculation PGE-009-CALC-003

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



Appendix LT-1 to Calculation PGE-009-CALC-003

```
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
```



Appendix LT-1 to Calculation PGE-009-CALC-003

```
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
```



**ENERCON
SERVICES, INC.**

Appendix LT-1 to Calculation PGE-009-CALC-003

```

/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
```



**ENERCON
SERVICES, INC.**

Appendix LT-1 to Calculation PGE-009-CALC-003

/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



Appendix LT-1 to Calculation PGE-009-CALC-003

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



Appendix LT-1 to Calculation PGE-009-CALC-003

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



Appendix LT-1 to Calculation PGE-009-CALC-003

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.

Appendix LT-1 to Calculation PGE-009-CALC-003

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



Appendix LT-1 to Calculation PGE-009-CALC-003

=====

===== 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 =====

=====



Appendix LT-1 to Calculation PGE-009-CALC-003

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



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Appendix LT-1 to Calculation PGE-009-CALC-003

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
------	----	----	----	-----	-----	-----

Appendix LT-1 to Calculation PGE-009-CALC-003

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 =====
```




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Appendix LT-1 to Calculation PGE-009-CALC-003

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



Appendix LT-1 to Calculation PGE-009-CALC-003

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
```



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Appendix LT-1 to Calculation PGE-009-CALC-003

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
```



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Appendix LT-1 to Calculation PGE-009-CALC-003

```

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

```

Appendix LT-1 to Calculation PGE-009-CALC-003

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



Appendix LT-1 to Calculation PGE-009-CALC-003

***** 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.

=====

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.

=====

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

Appendix LT-1 to Calculation PGE-009-CALC-003

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.



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Appendix LT-1 to Calculation PGE-009-CALC-003

=====

===== 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 =====

=====



Appendix LT-1 to Calculation PGE-009-CALC-003

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



Appendix LT-1 to Calculation PGE-009-CALC-003

***** 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



Appendix LT-1 to Calculation PGE-009-CALC-003

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.

=====



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Appendix LT-1 to Calculation PGE-009-CALC-003

===== 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.



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Sheet 62 of 62

Appendix LT-1 to Calculation PGE-009-CALC-003

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


EXIT THE ANSYS POST1 DATABASE PROCESSOR

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



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Appendix MD-1 to Calculation PGE-009-CALC-003

Originator: 
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.



Appendix MD-1 to Calculation PGE-009-CALC-003

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.

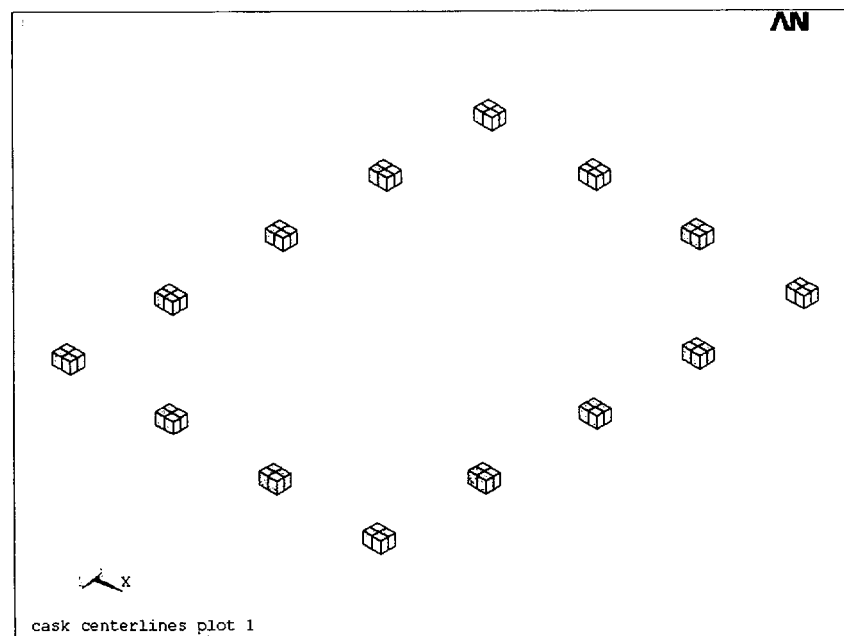


Figure 1 - Initial node set and first execution of ENODE

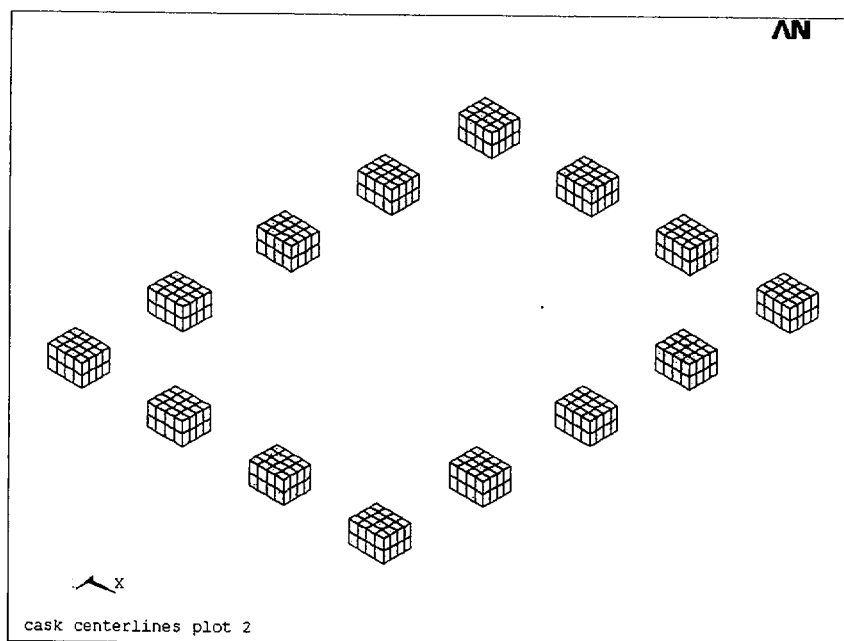


Figure 2 - Execution of NELEM followed by ENODE

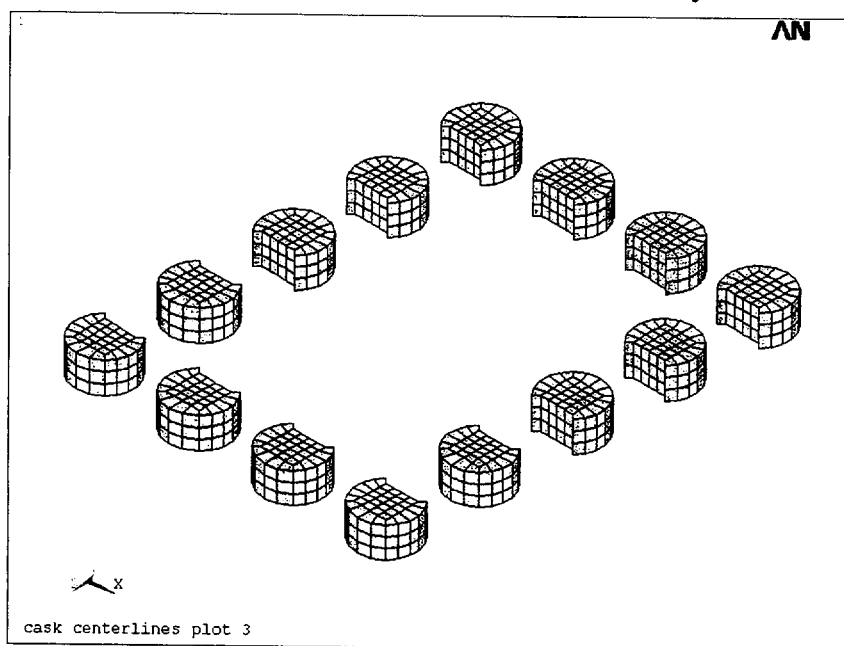


Figure 3- Execution of NELEM followed by ENODE

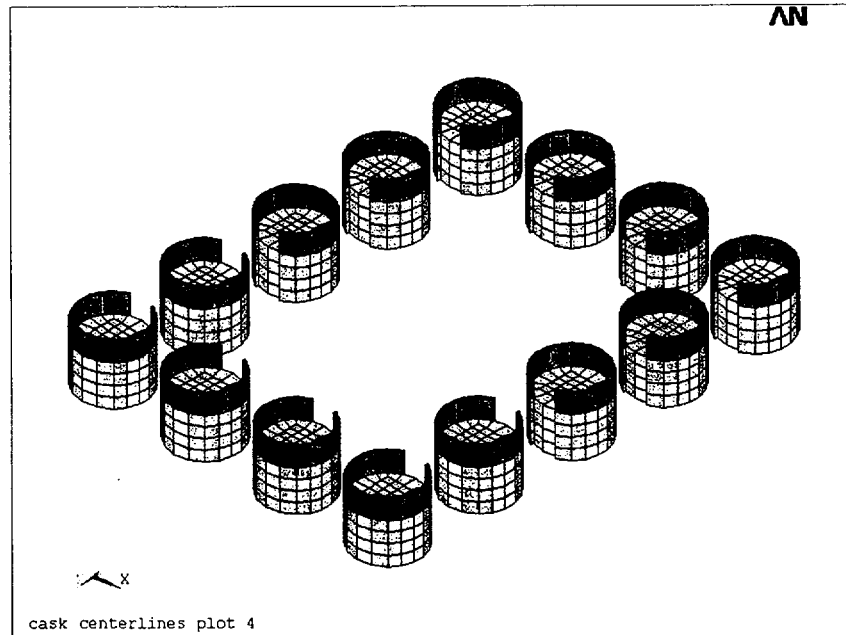


Figure 4- Execution of NELEM followed by ENODE

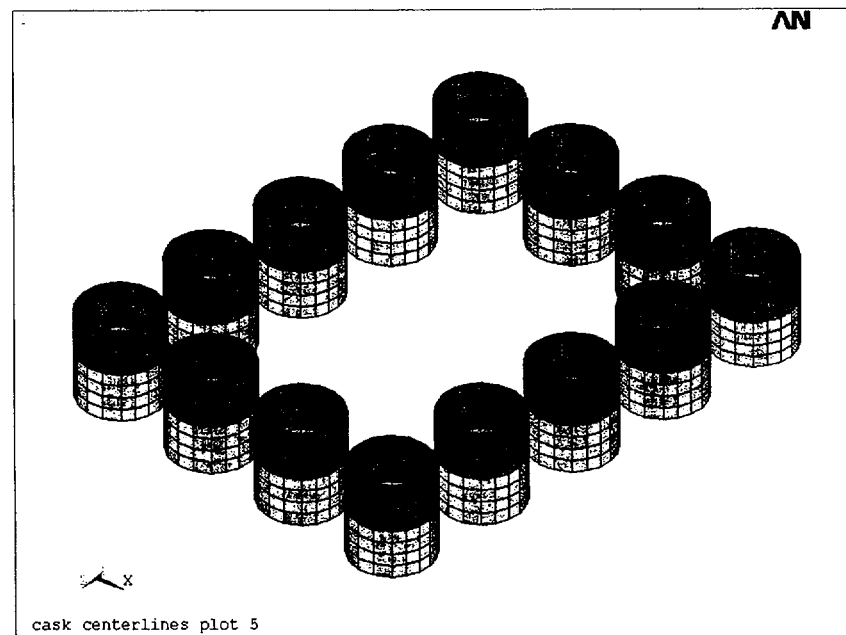


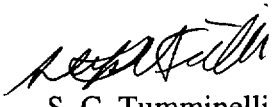
Figure 5- Execution of NELEM followed by ENODE

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.



**ENERCON
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Appendix MD-2 to Calculation PGE-009-CALC-003


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.

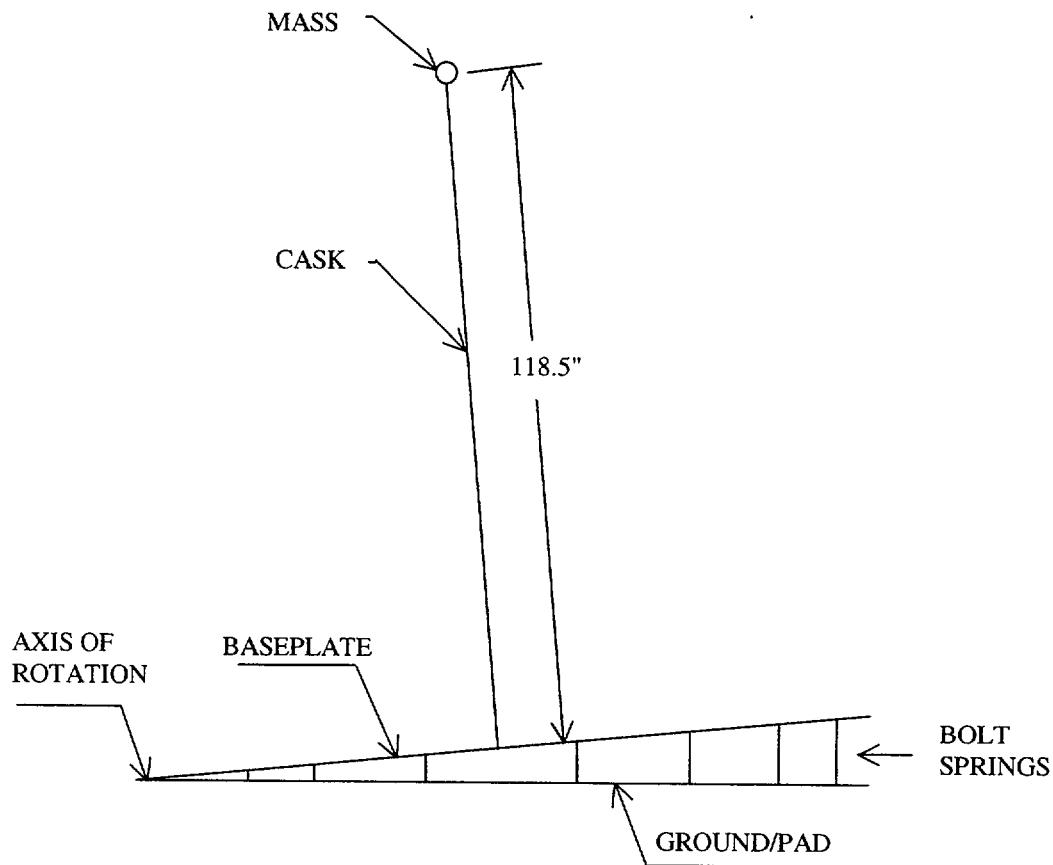


Figure 1



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:

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

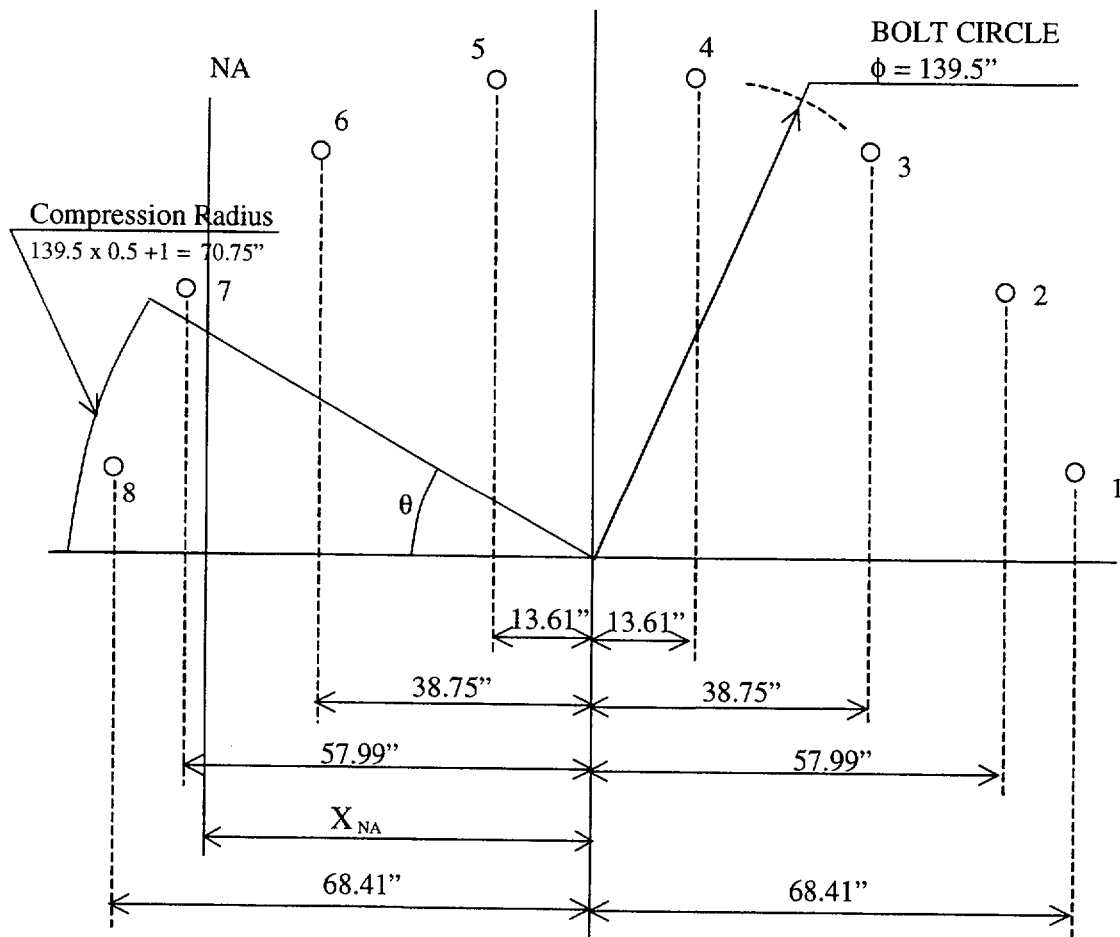
$$\sum k_M = k_s \sum \left(\frac{x}{h}\right)^2 = k_s \frac{\sum x^2}{h^2} \quad \text{where the summation is over the } x\text{'s, i.e., the distances from the neutral axis to the bolt.}$$

Therefore:

$$f = \frac{1}{2\pi} \sqrt{\frac{k_s \sum x^2}{h^2 M}} = \frac{1}{2h\pi} \sqrt{\frac{k_s \sum x^2}{M}} = \frac{1}{2h\pi} \sqrt{\frac{k_s \sum x^2 g}{W}}$$



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:

$$X_{NA} = 57.94 \text{ in}$$

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

Twelve (2 x 6) bars are in tension:

Tension force in the bars:

$$P_{y, \min} = 176.7 \text{ kips}$$

$$P_{y, \max} = 235.6 \text{ kips}$$

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

$$\text{Net tension force: } T = 2 \times 6 \times 206.2 = 2474.4 \text{ kip}$$

Concrete compression force:

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

Net compression force:

$$\begin{aligned} C &= 3.5 R^2 \left(\theta - \frac{1}{2} \sin 2\theta \right) = \\ &= 3.5 \times 70.75^2 \left(0.6112 - \frac{1}{2} \sin(2 \times 35.02) \right) = 2474.4 \text{ kip, versus } 2474.4 \text{ kip, OK} \end{aligned}$$

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;

$$f = \frac{1}{(2)(118.5)\pi} \sqrt{\frac{2(1.932 \times 10^6)(46222)(386.4)}{360000}} = 18.6 \text{ Hz, accounting for 2 bolts at each x.}$$

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;

$$f = \frac{1}{(2)(118.5)\pi} \sqrt{\frac{2(1.932 \times 10^6)(37340)(386.4)}{360000}} = 16.7 \text{ Hz, accounting for 2 bolts at each x}$$

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.

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

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

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

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



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

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

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:

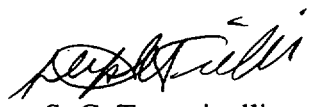
$$I = \frac{\pi}{64} (d_o^4 - d_i^4) = \frac{\pi}{64} ((139.5 + 12)^4 - (139.5 - 12)^4) = 12.887 \times 10^6 \text{ inches}^4$$

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



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Appendix MD-3 to Calculation PGE-009-CALC-003

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.



Appendix MD-3 to Calculation PGE-009-CALC-003

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 U_y 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 $\pm 10\%$ 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 $\pm 10\%$, $\pm 5\%$ and $\pm 1\%$. 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

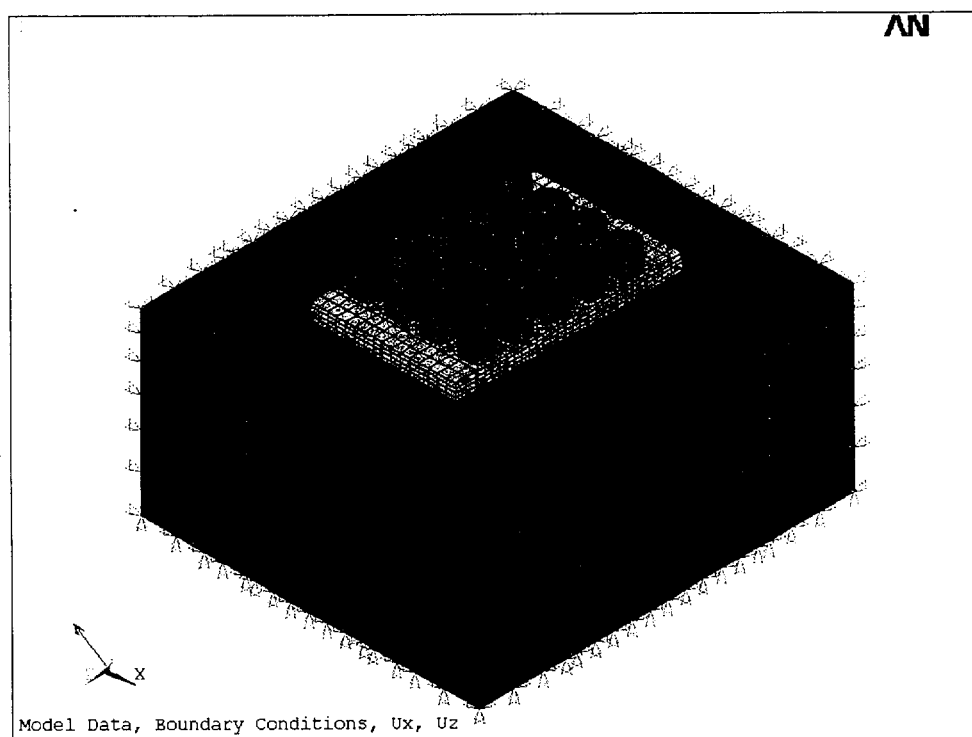


Figure MD - 3 - 1 Isometric of Boundary Conditions on the Rock Mass

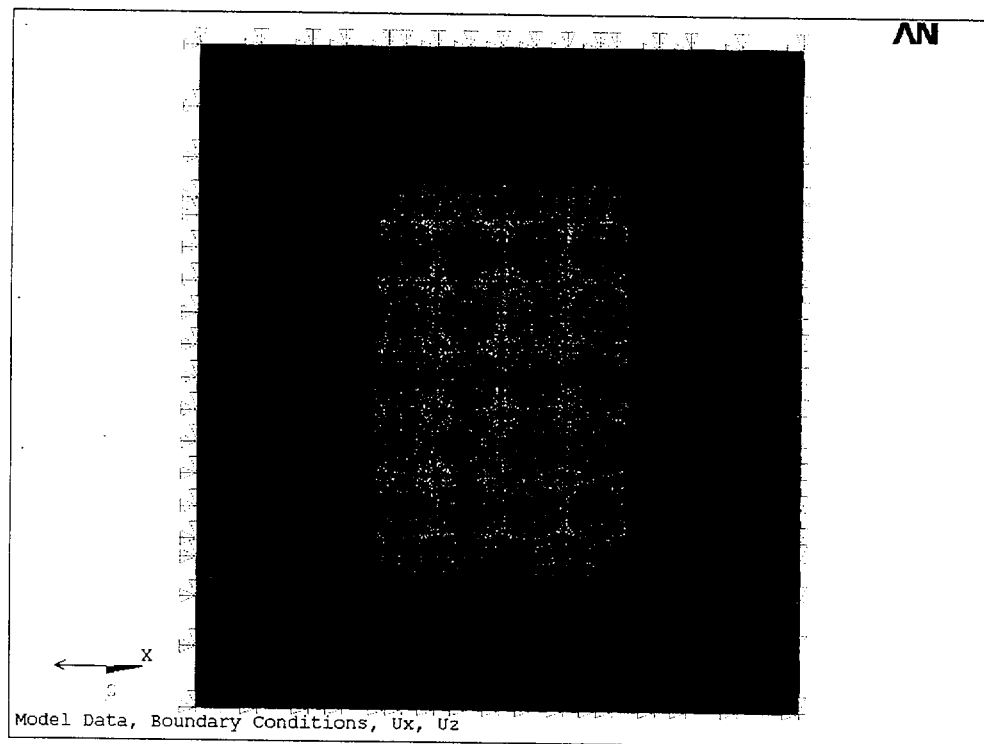


Figure MD - 3 - 2 Boundary Conditions on the Rock Mass Looking Down

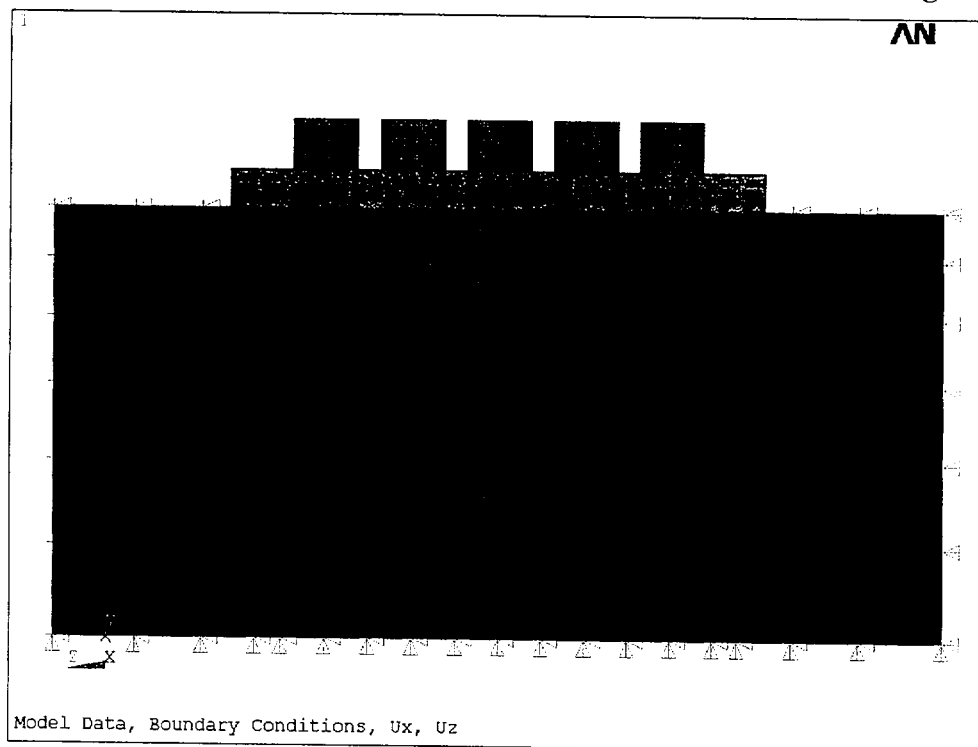


Figure MD - 3 - 3 Boundary Conditions on the Rock Mass Looking from the Side



Table MD - 3.0 – Quantification of Analysis Responses

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

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		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	-0.000528	-0.000242	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	σ_x Max U,x,y,z	σ_x Max U,x,z	Ratio x,z/x,y,z	σ_x Min U,x,y,z	σ_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	σ_z Max U,x,y,z	σ_z Max U,x,z	Ratio x,z/x,y,z	σ_z Min U,x,y,z	σ_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	$\sigma_{X \text{ Max}}$ U,x,y,z	$\sigma_{X \text{ Max}}$ U,x,z	RATIO x,y/x,y,x	$\sigma_{X \text{ Min}}$ U,x,y,z	$\sigma_{X \text{ Min}}$ 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	σ_z Max U,x,y,z	σ_z Max U,x,z	RATIO x,y/x,y,x	σ_z Min U,x,y,z	σ_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		
			σ_Y Max U,x,y,z	σ_Y Max U,x,z	RATIO x,y/x,y,x	σ_Y Max U,x,y,z	σ_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

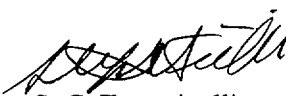
* Load components marked with a * are combined using the 40-100-40 rule. All others are combined using the 100-40-40 rule.



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Appendix MD-4 to Calculation PGE-009-CALC-003

Originator:

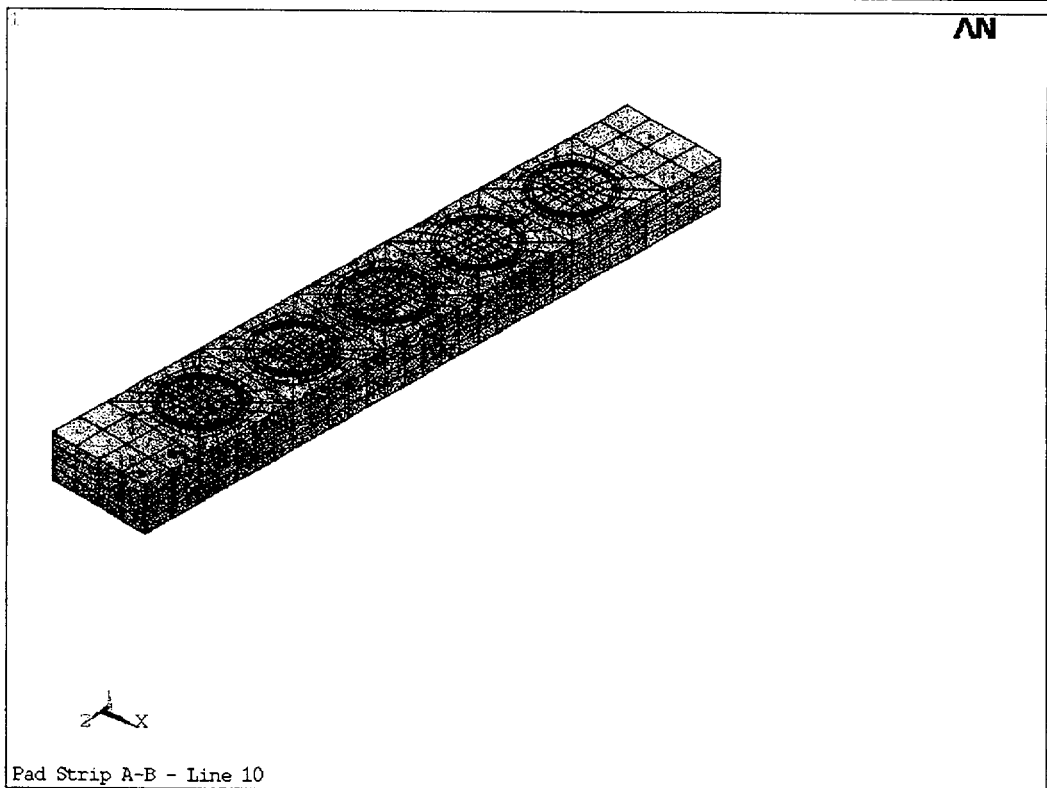
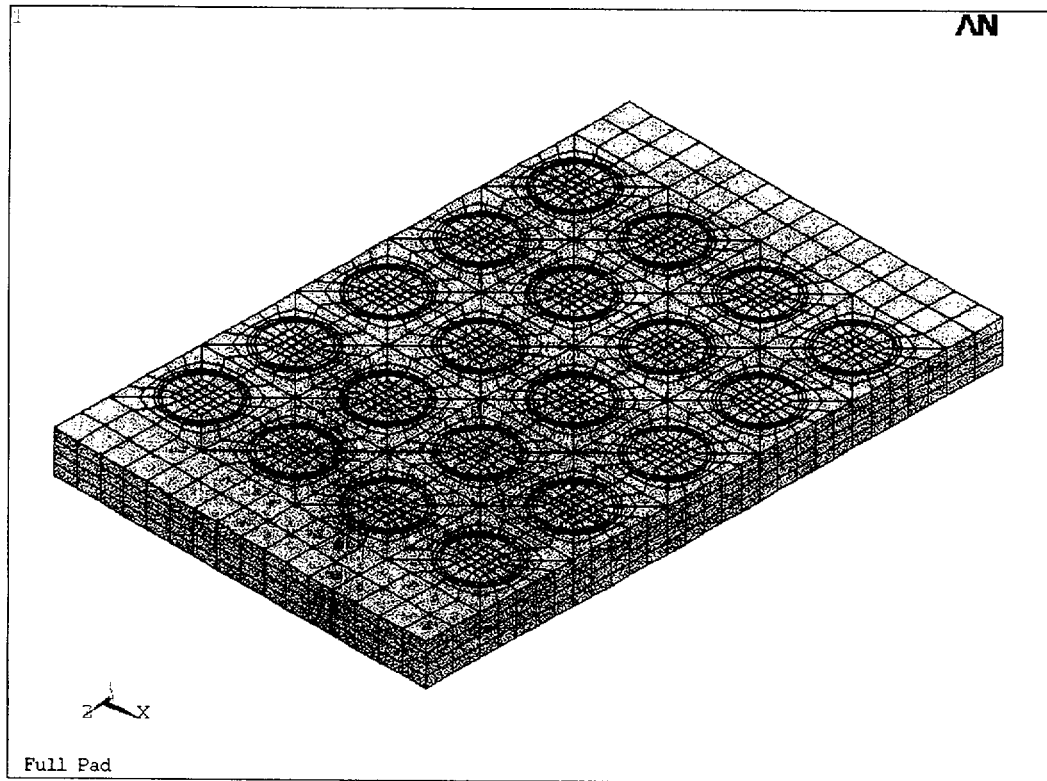

S. C. Tumminelli

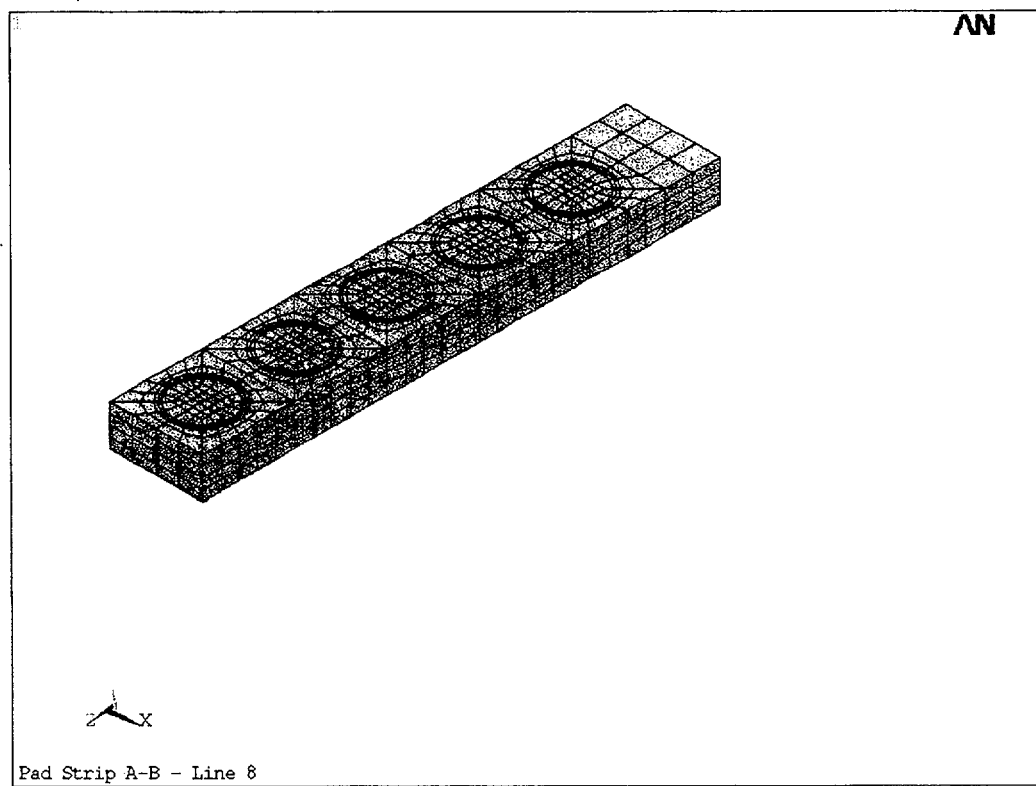
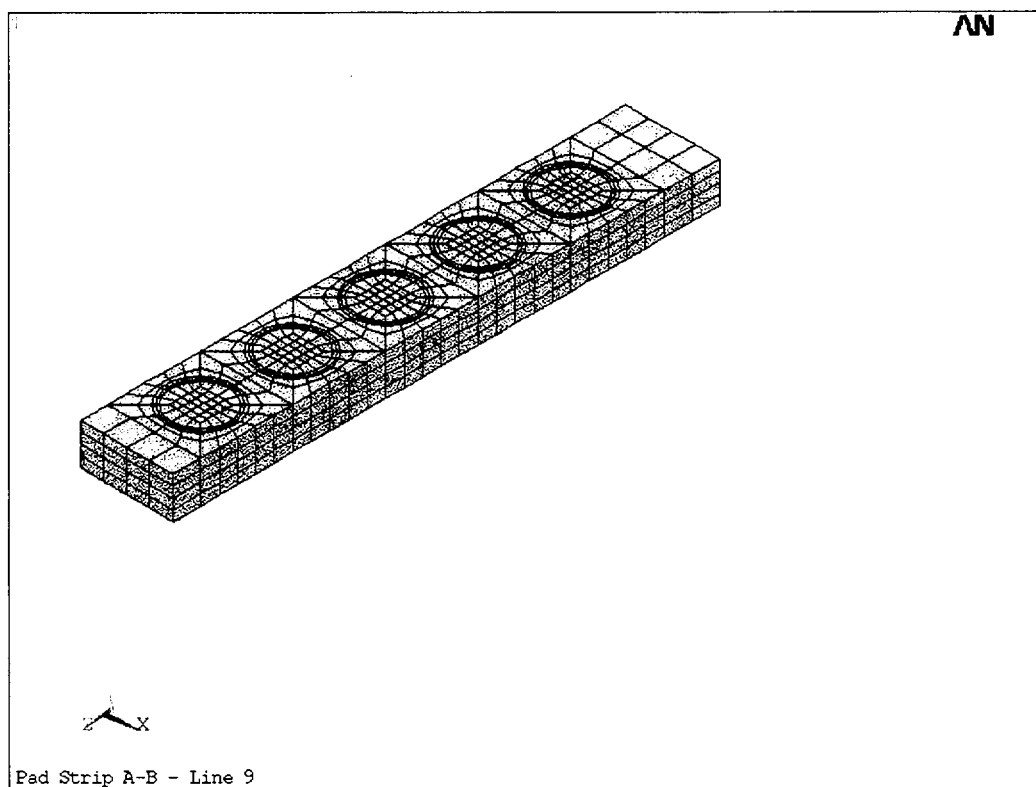
Date:

November 30, 2001

Appendix MD-4

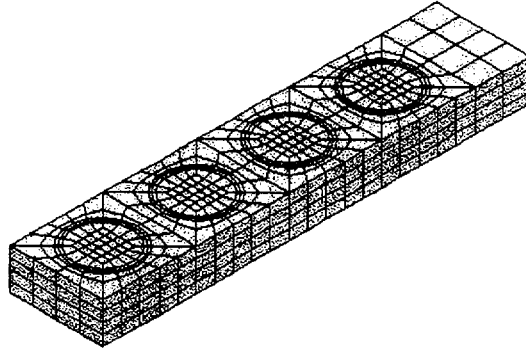
This Appendix presents the pad strips and sections, called lines, for the pad. The internal forces and moments are computed at these locations. The plots are followed by the ANSYS input file that created them. This file is a modification of the file used to compute the forces in Appendices FC-1 and FC-2.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





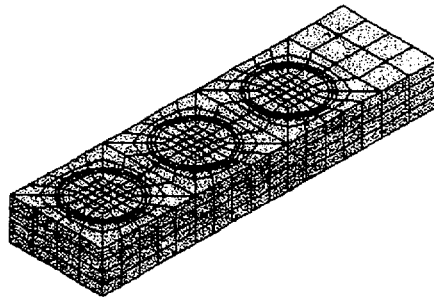


AN



Pad Strip A-B - Line 7

AN



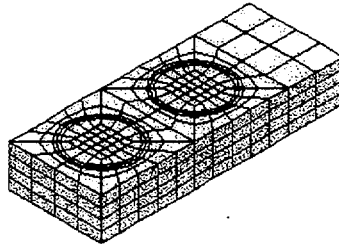
Pad Strip A-B - Line 6



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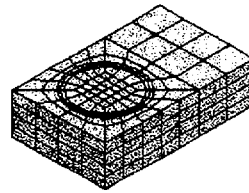
Appendix MD-4 to Calculation PGE-009-CALC-003

AN

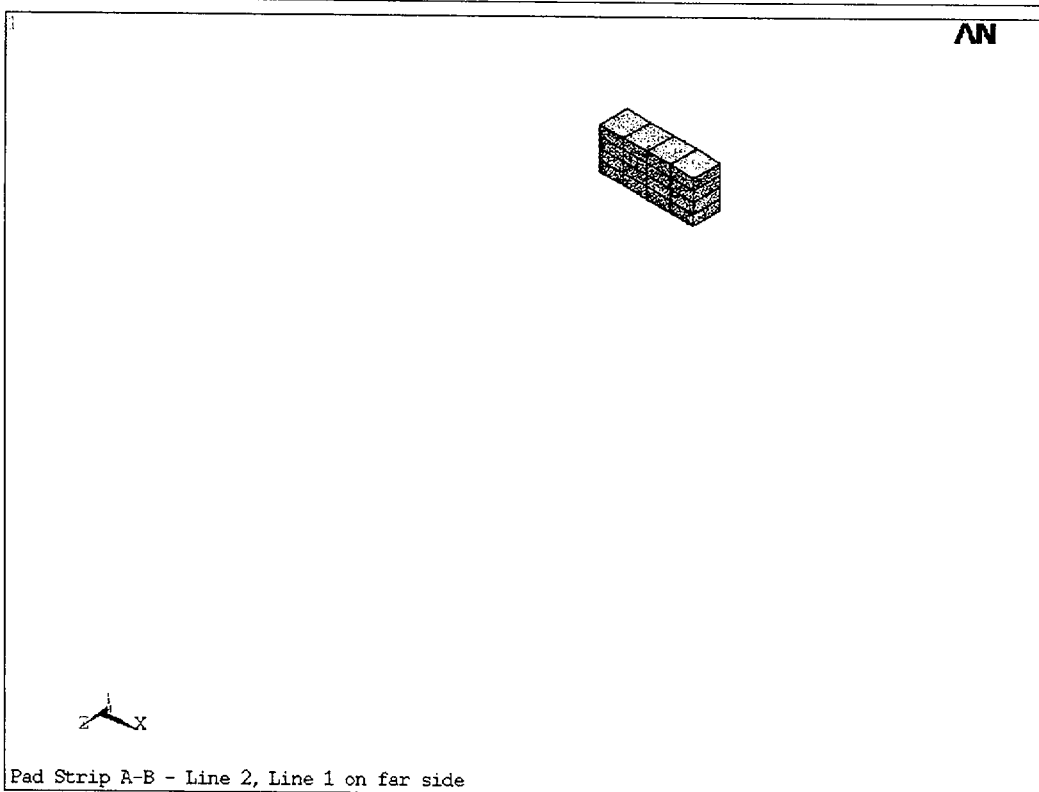
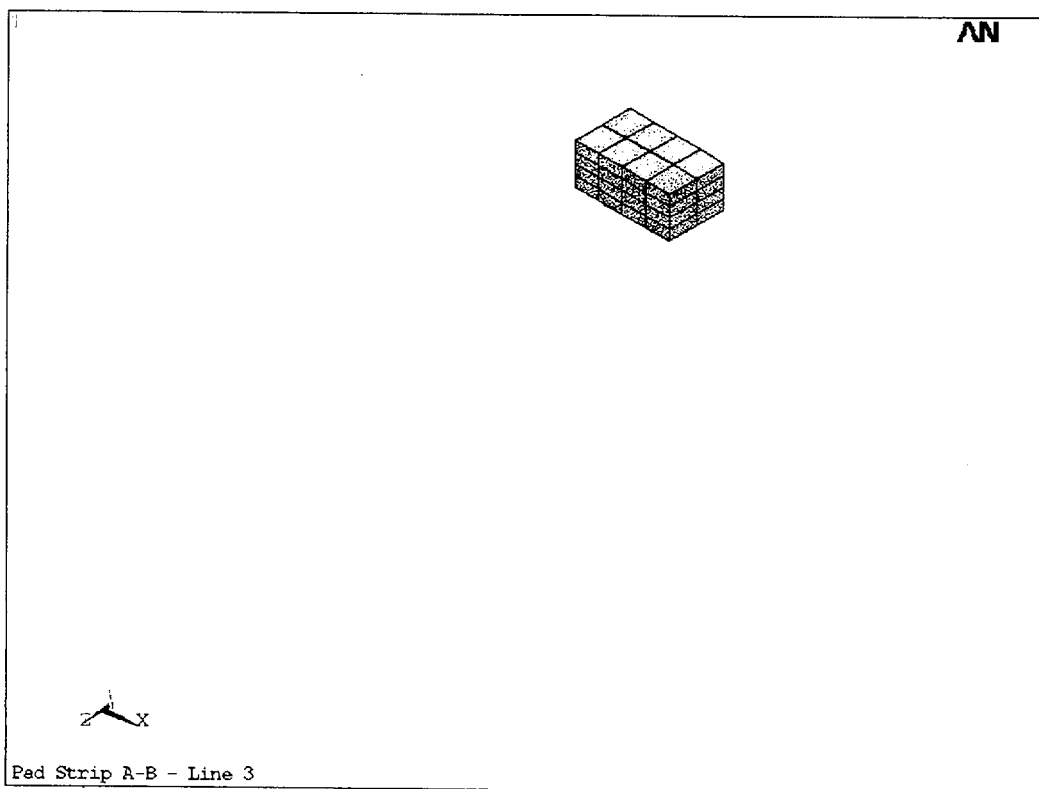


Pad Strip A-B - Line 5

AN

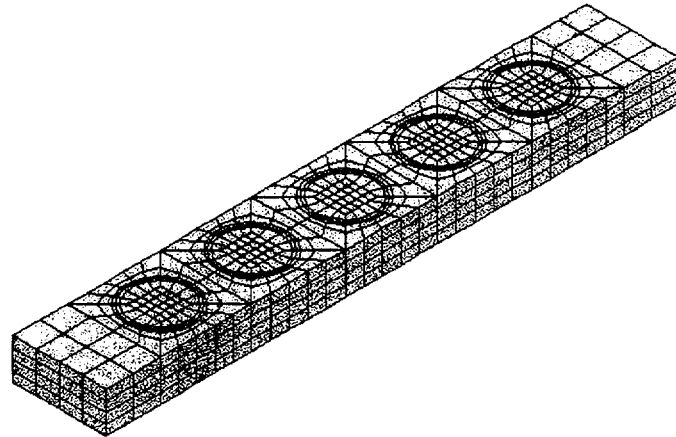


Pad Strip A-B - Line 4



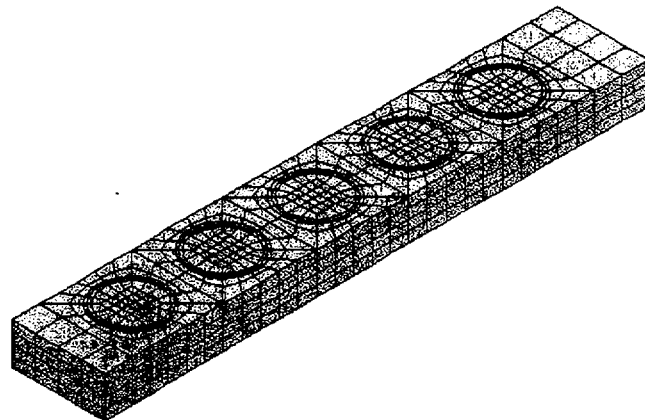


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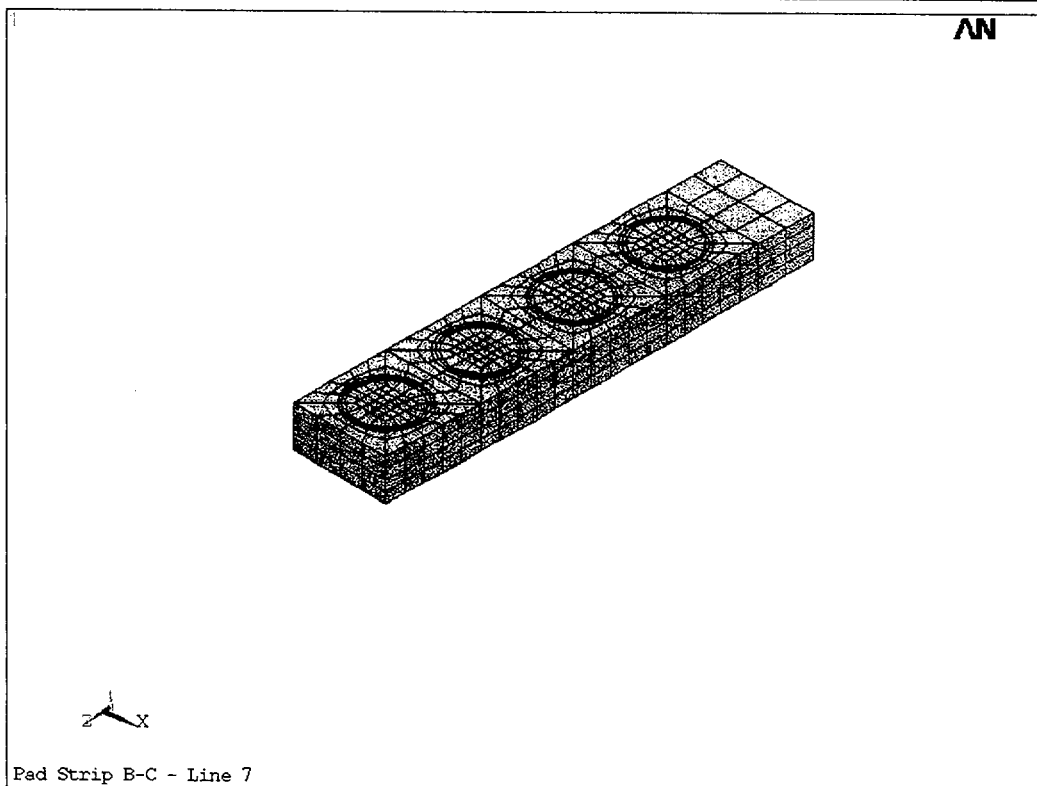
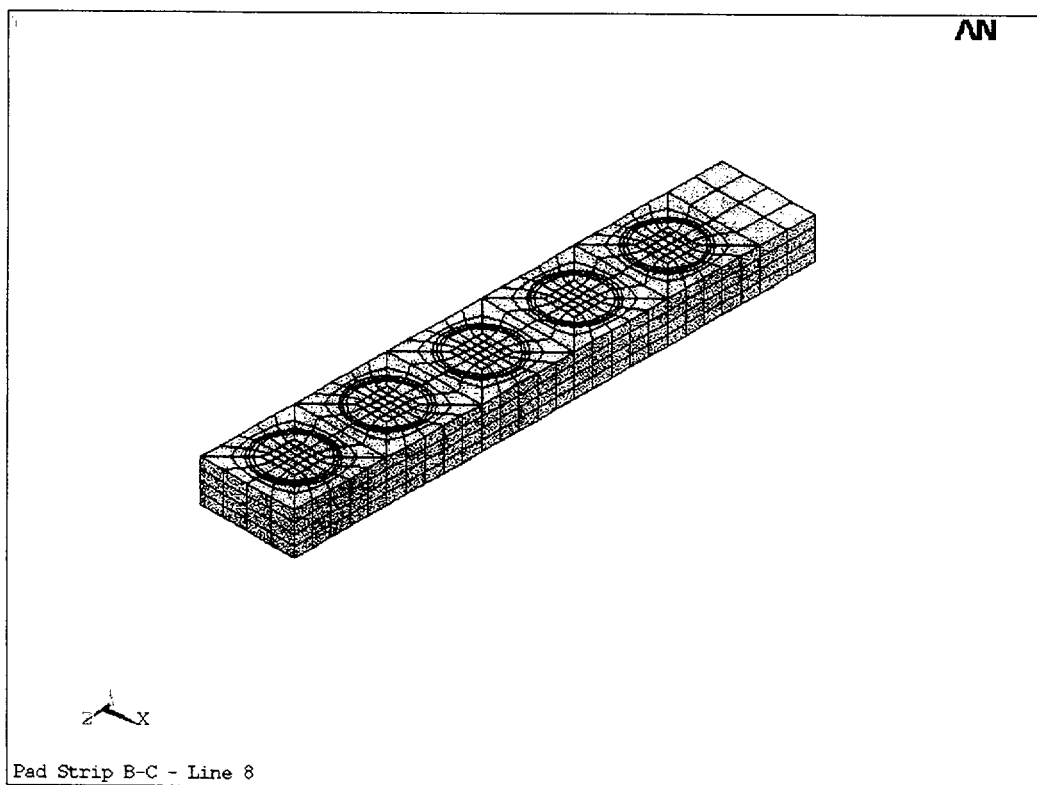


Pad Strip B-C - Line 10

AN

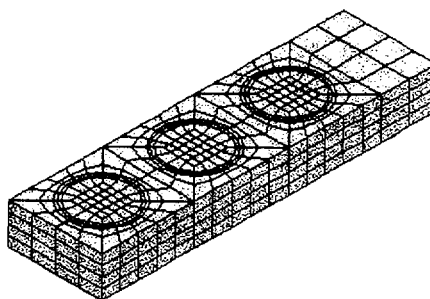


Pad Strip B-C - Line 9



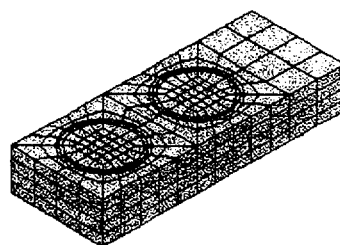


AN

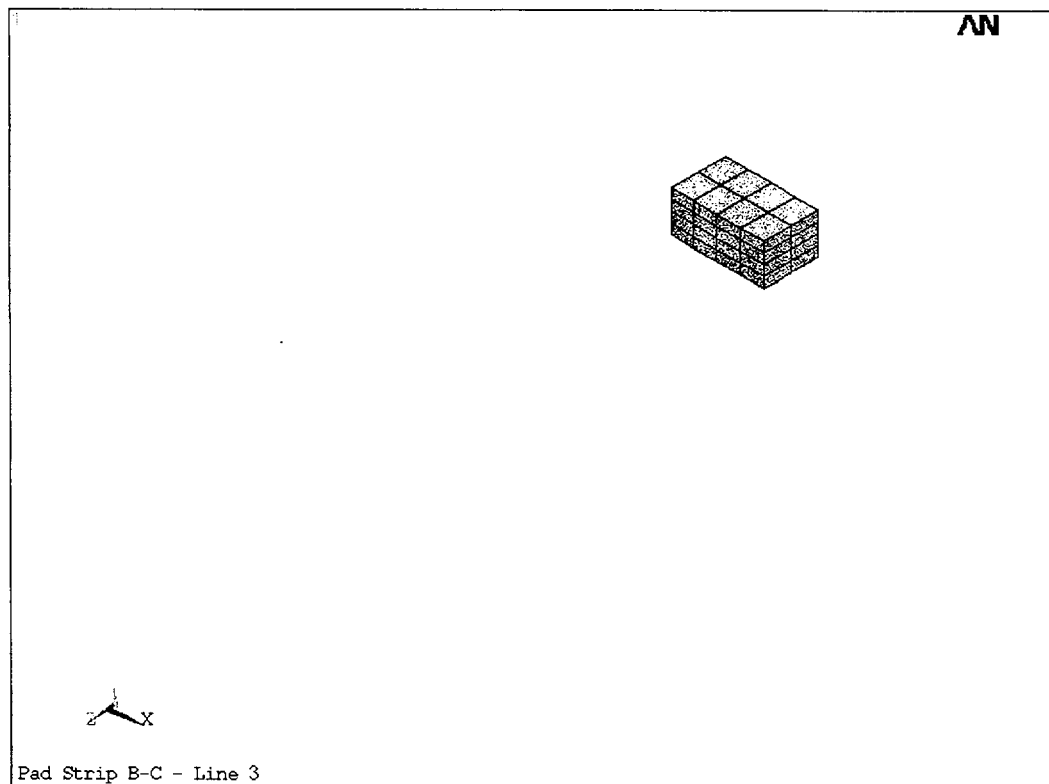
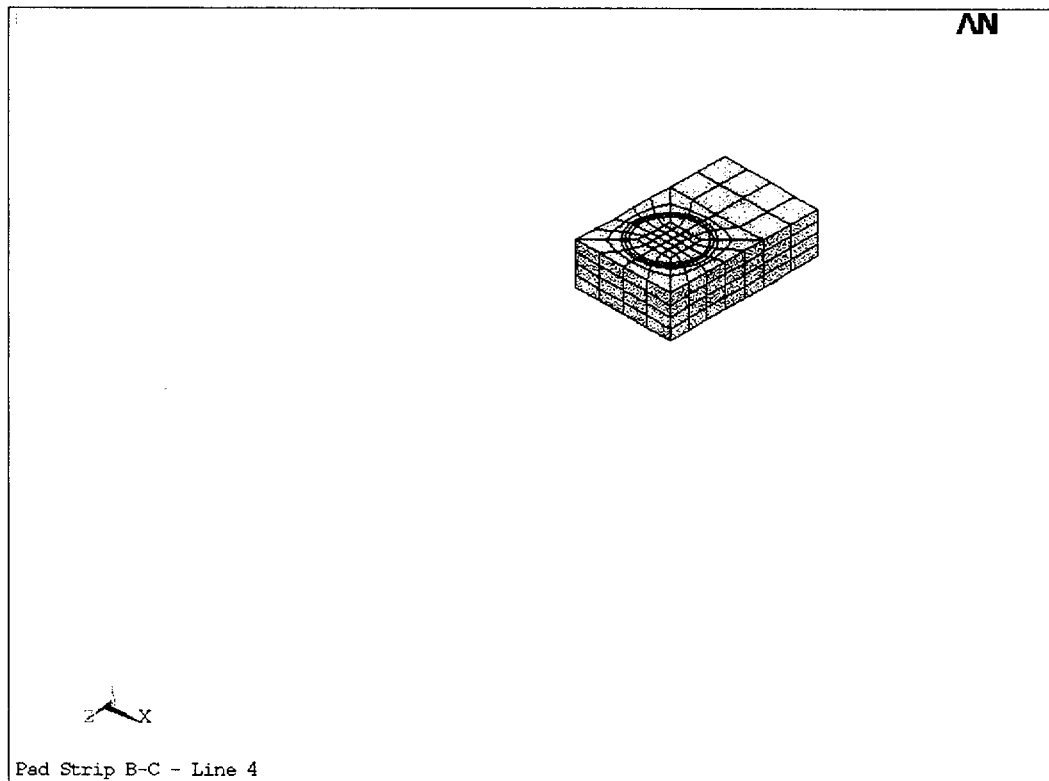


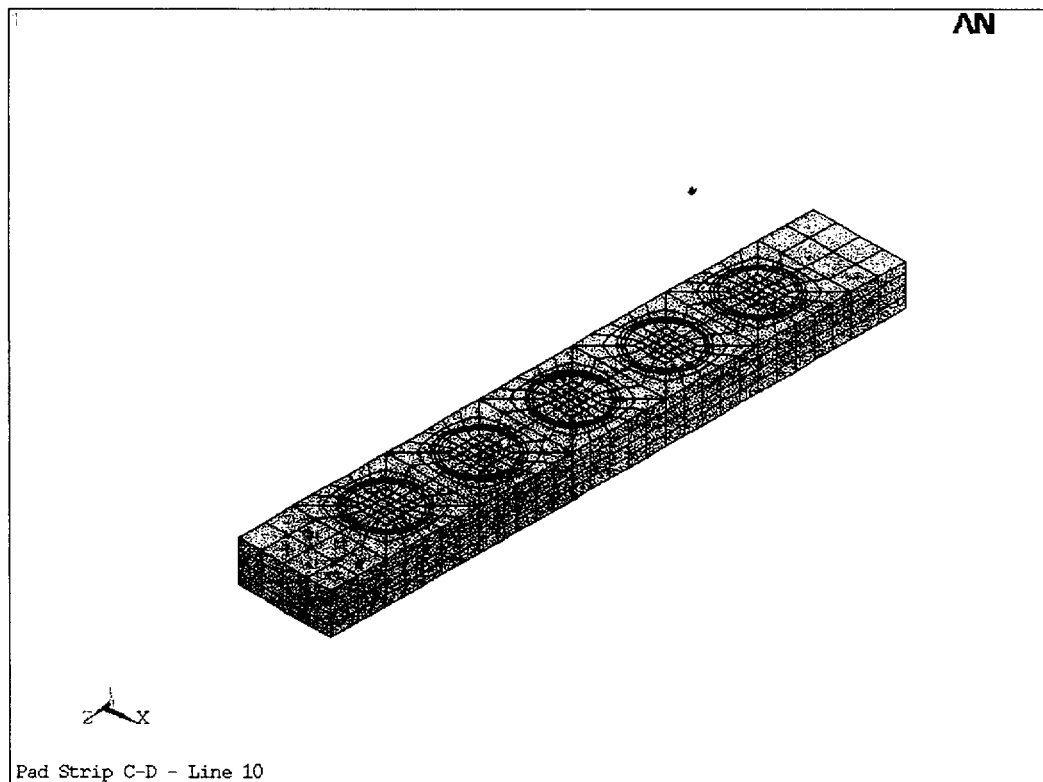
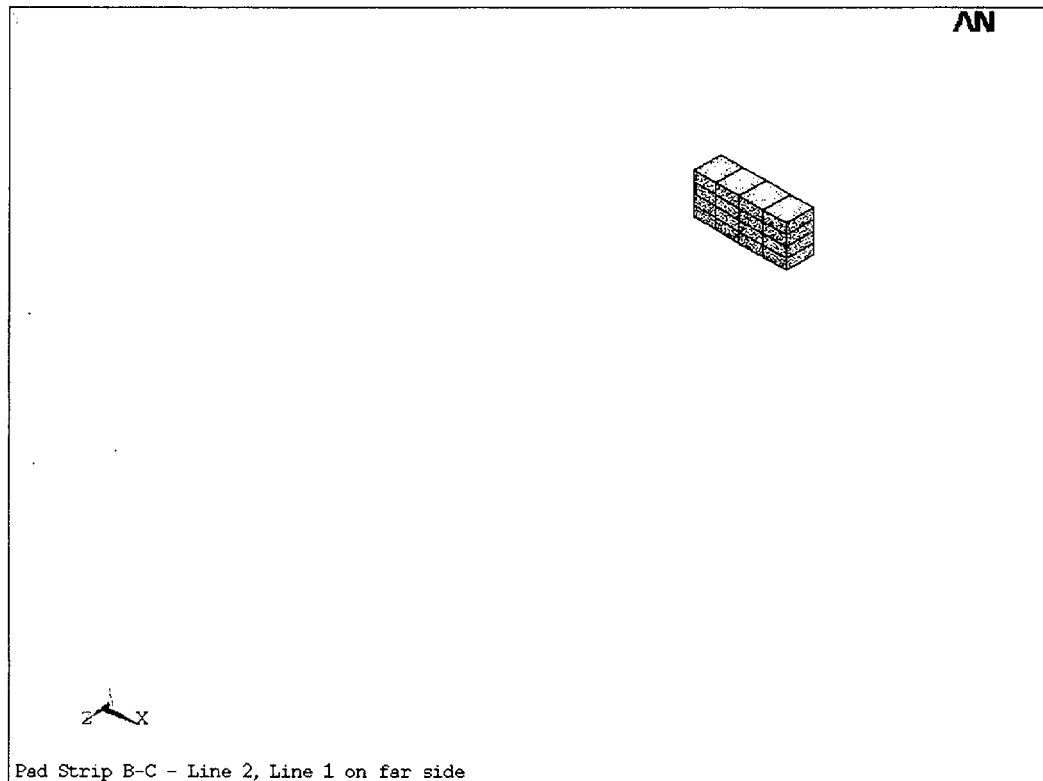
Pad Strip B-C - Line 6

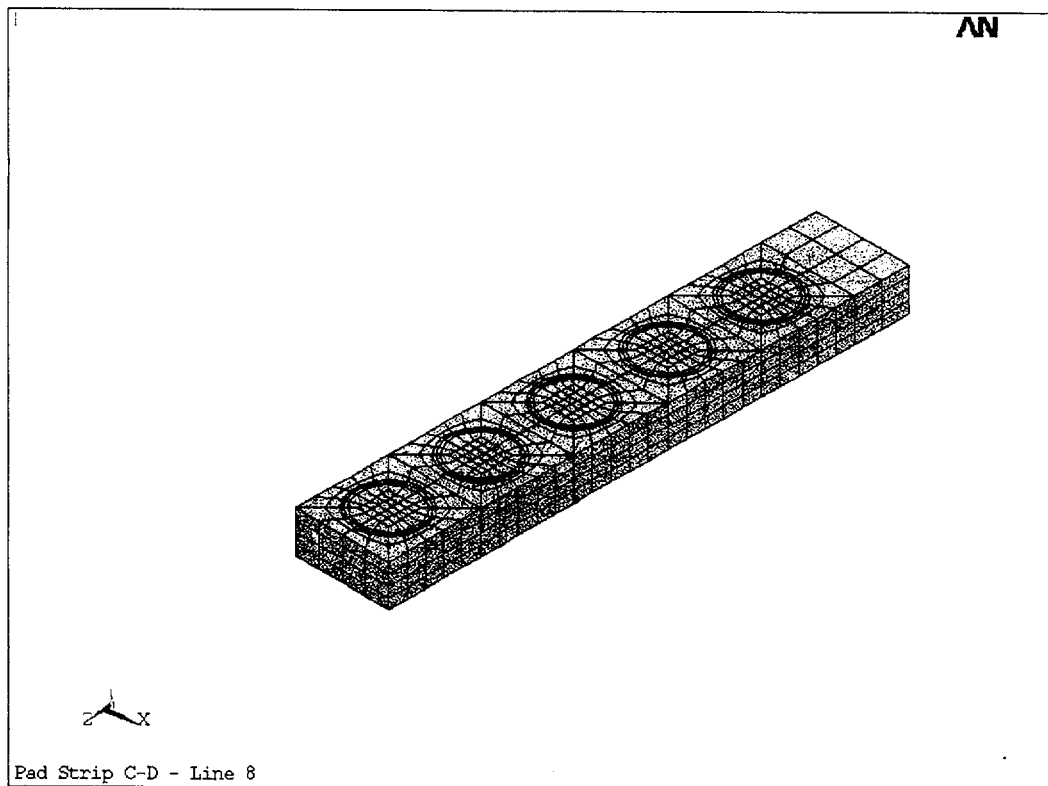
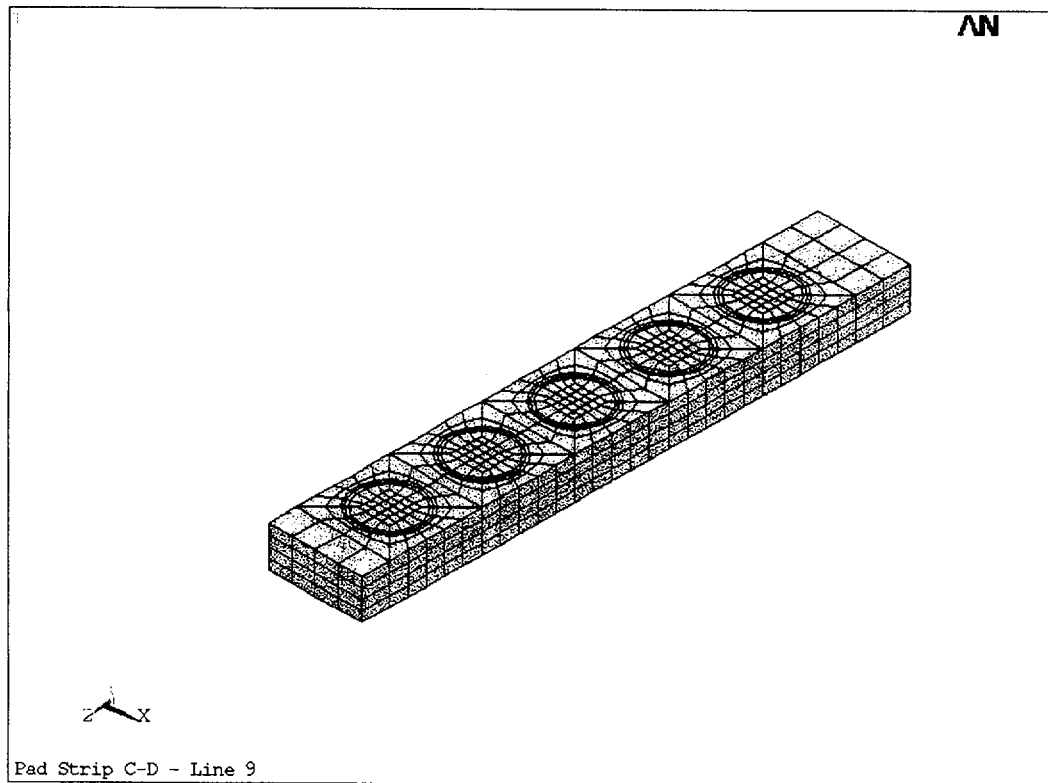
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Pad Strip B-C - Line 5

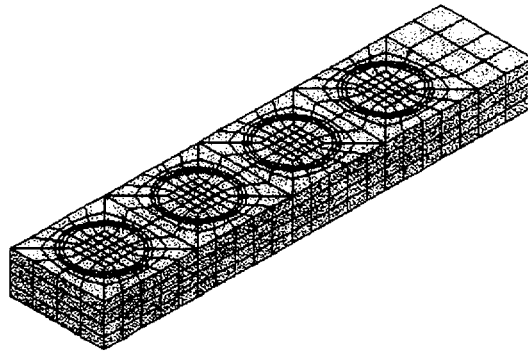






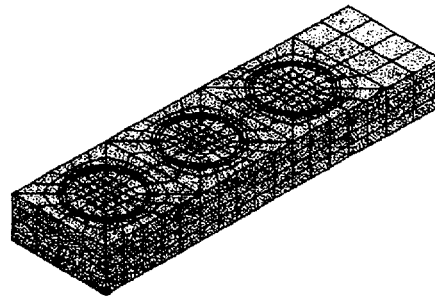


AN



Pad Strip C-D - Line 7

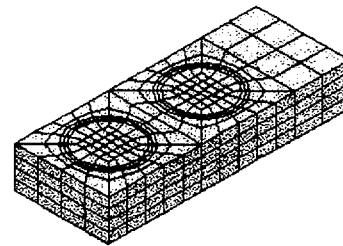
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Pad Strip C-D - Line 6

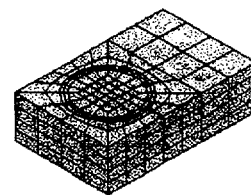


AN



Ped Strip C-D - Line 5

AN

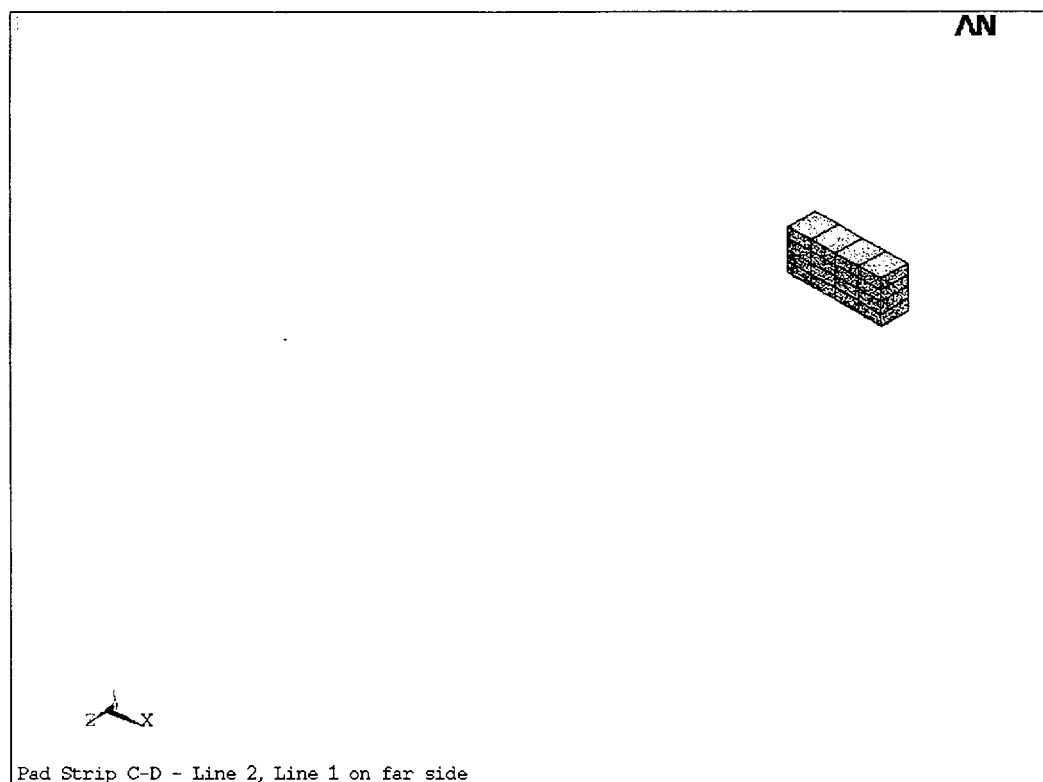
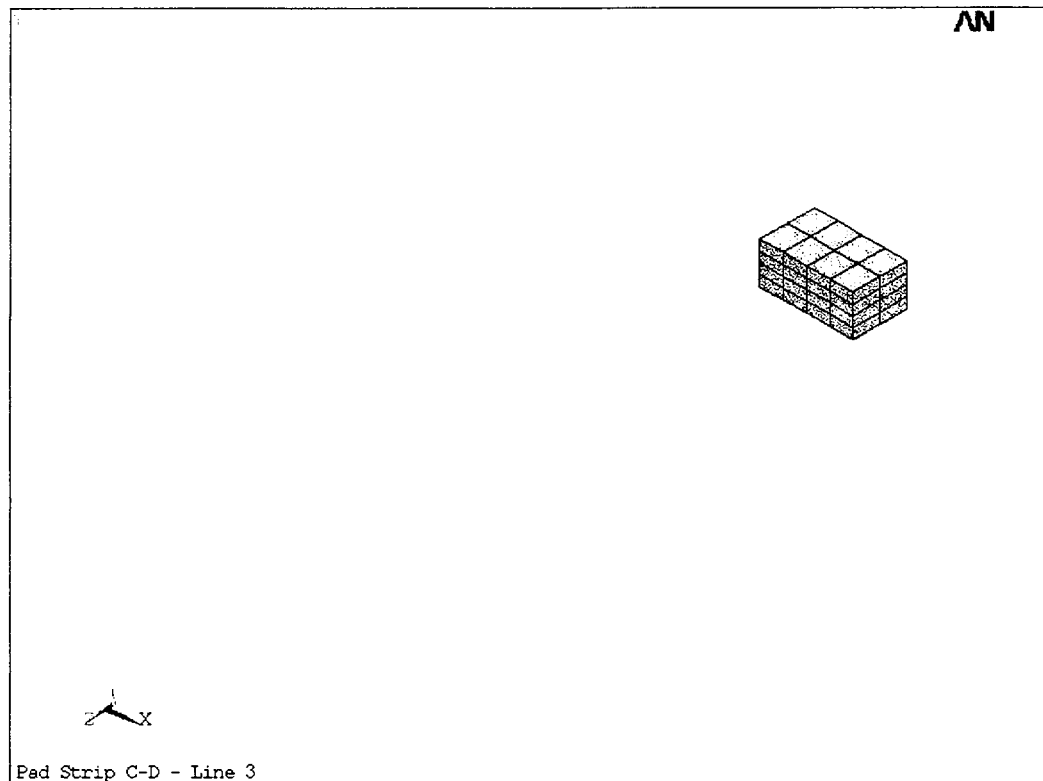


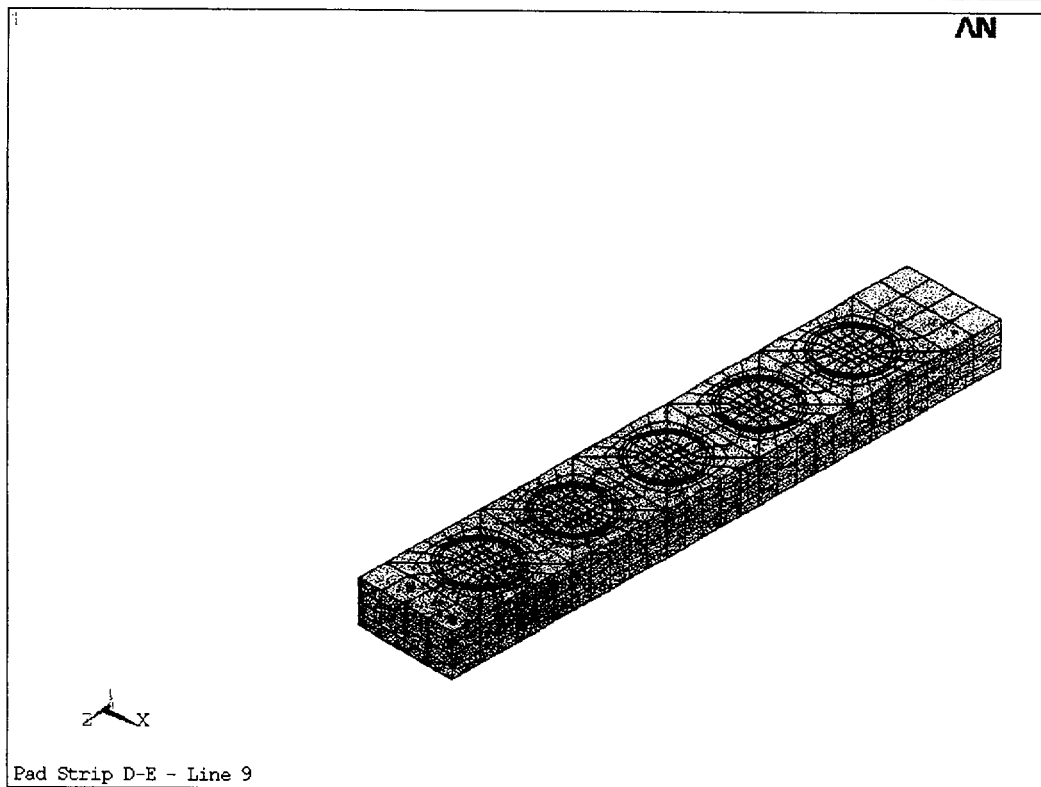
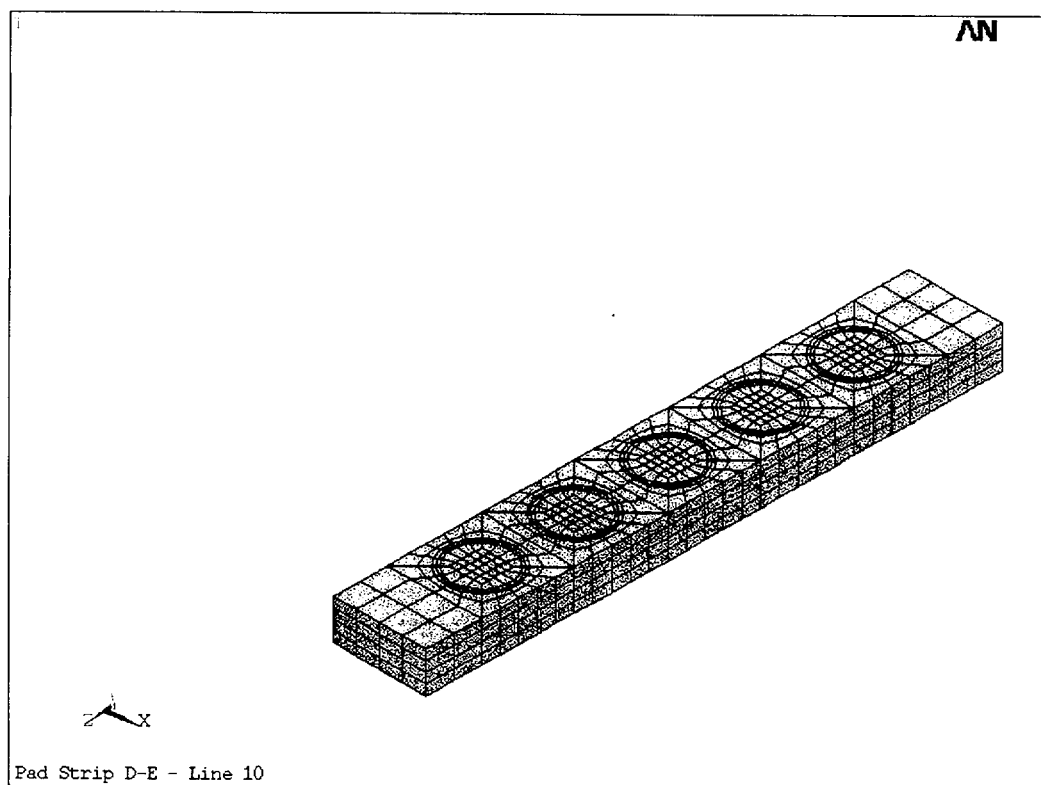
Pad Strip C-D - Line 4



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Appendix MD-4 to Calculation PGE-009-CALC-003

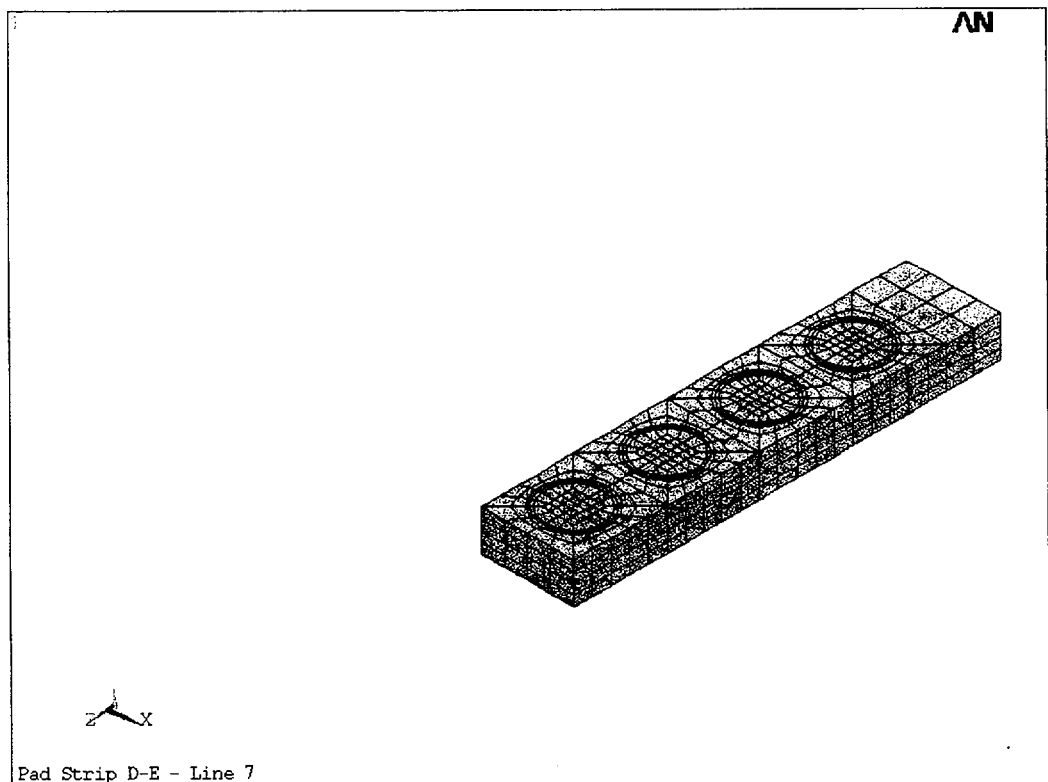
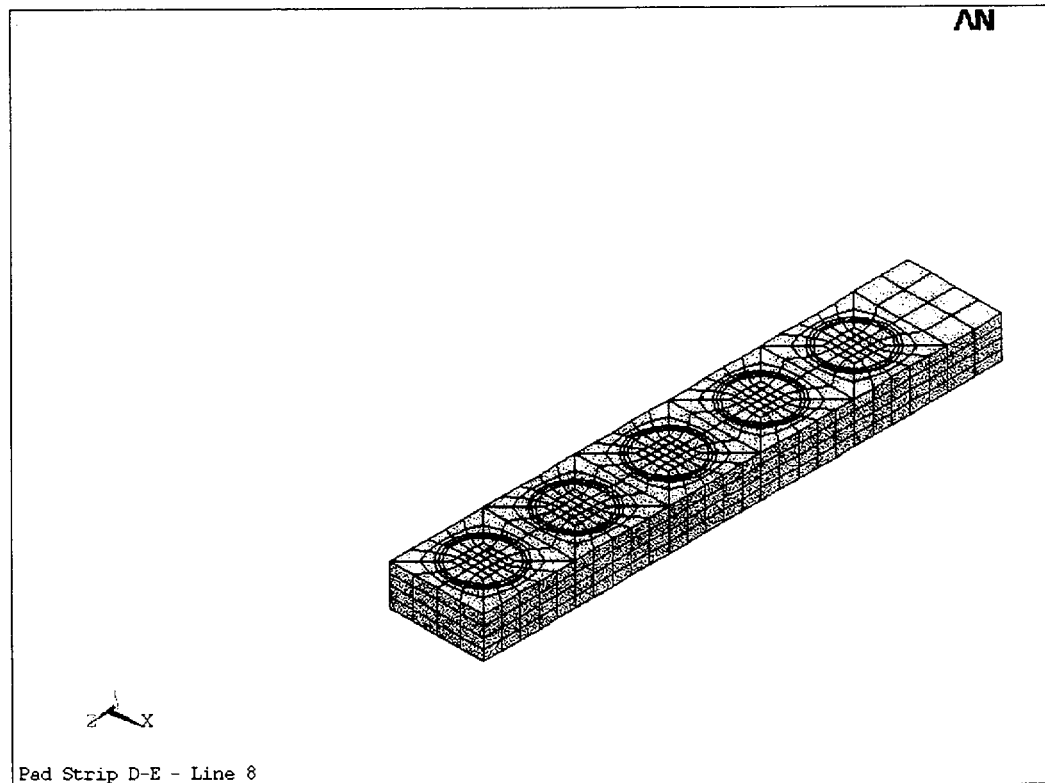


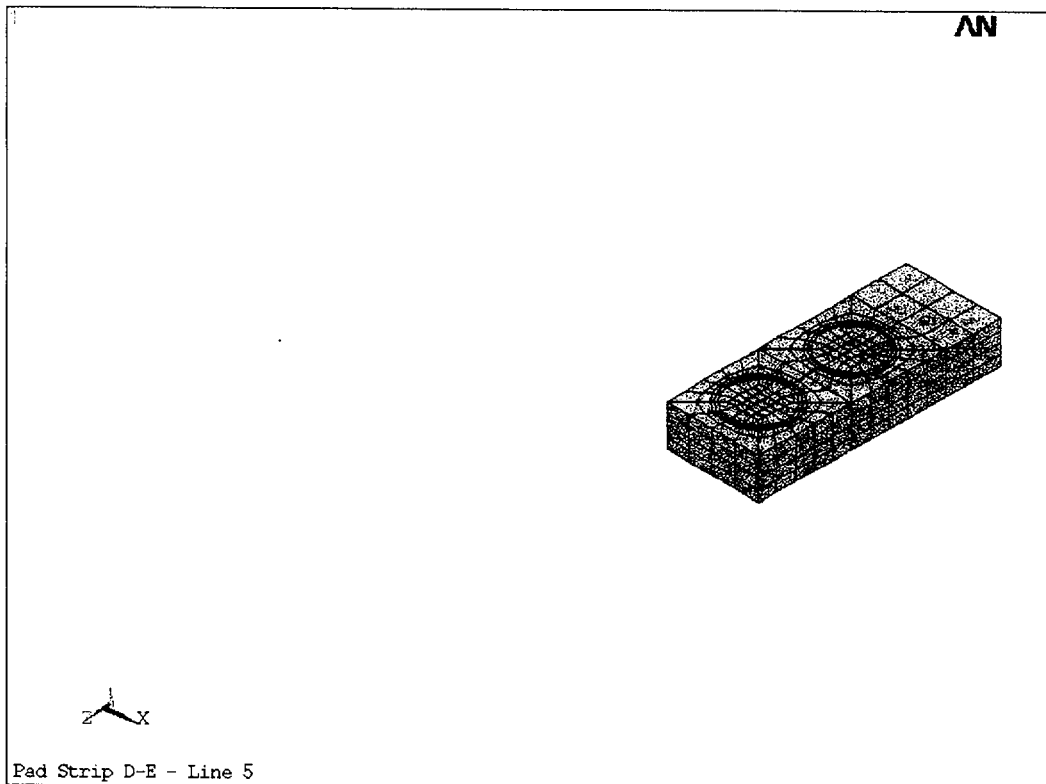
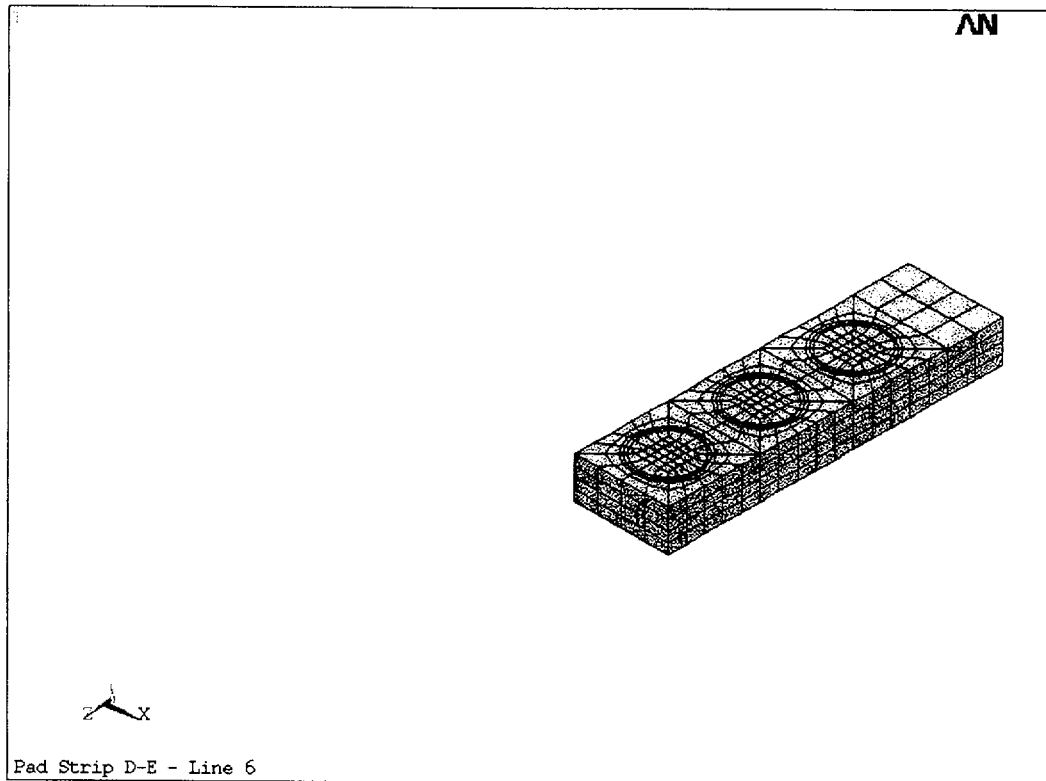




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Appendix MD-4 to Calculation PGE-009-CALC-003

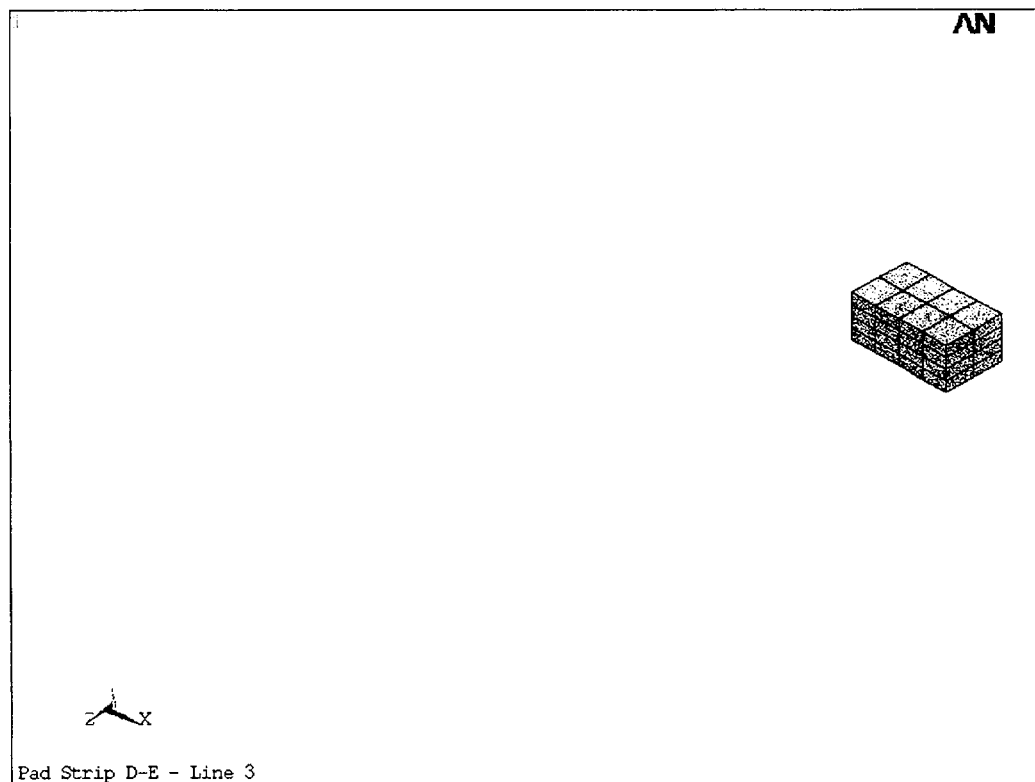
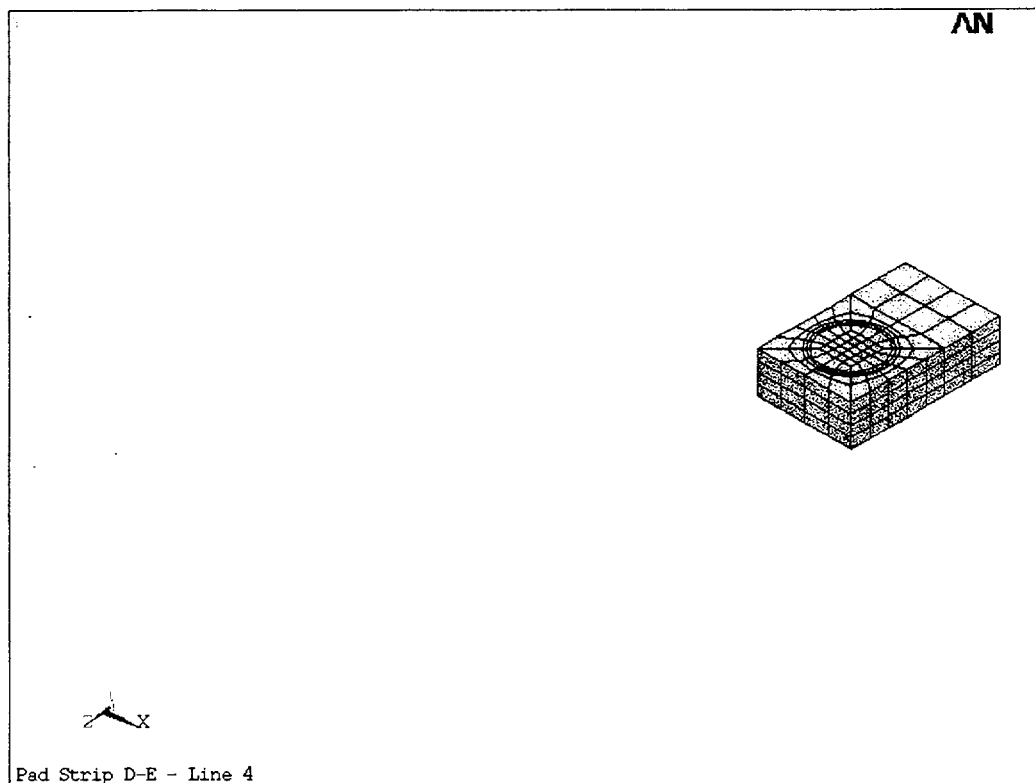


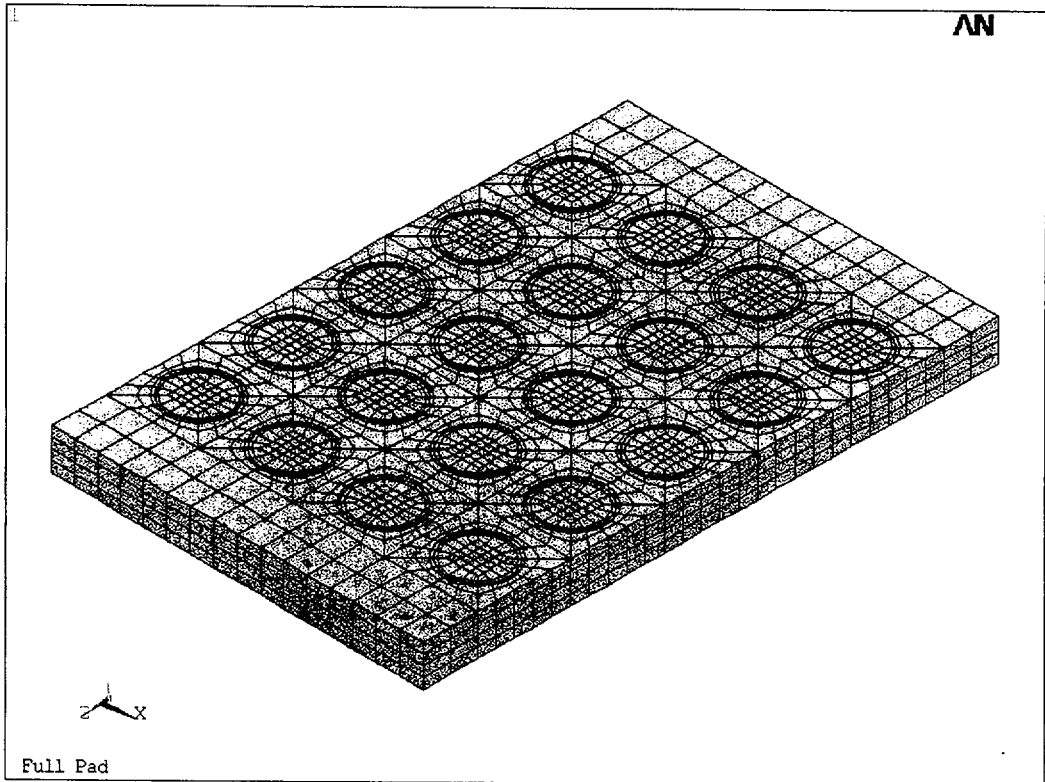
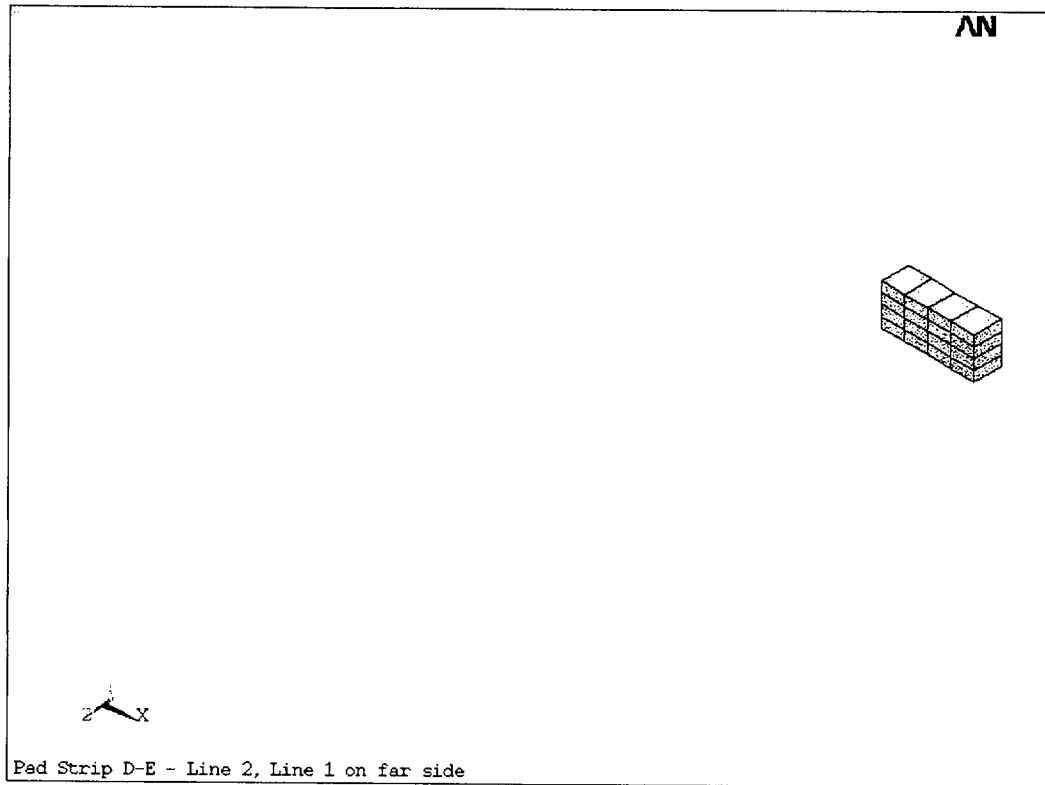




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Appendix MD-4 to Calculation PGE-009-CALC-003

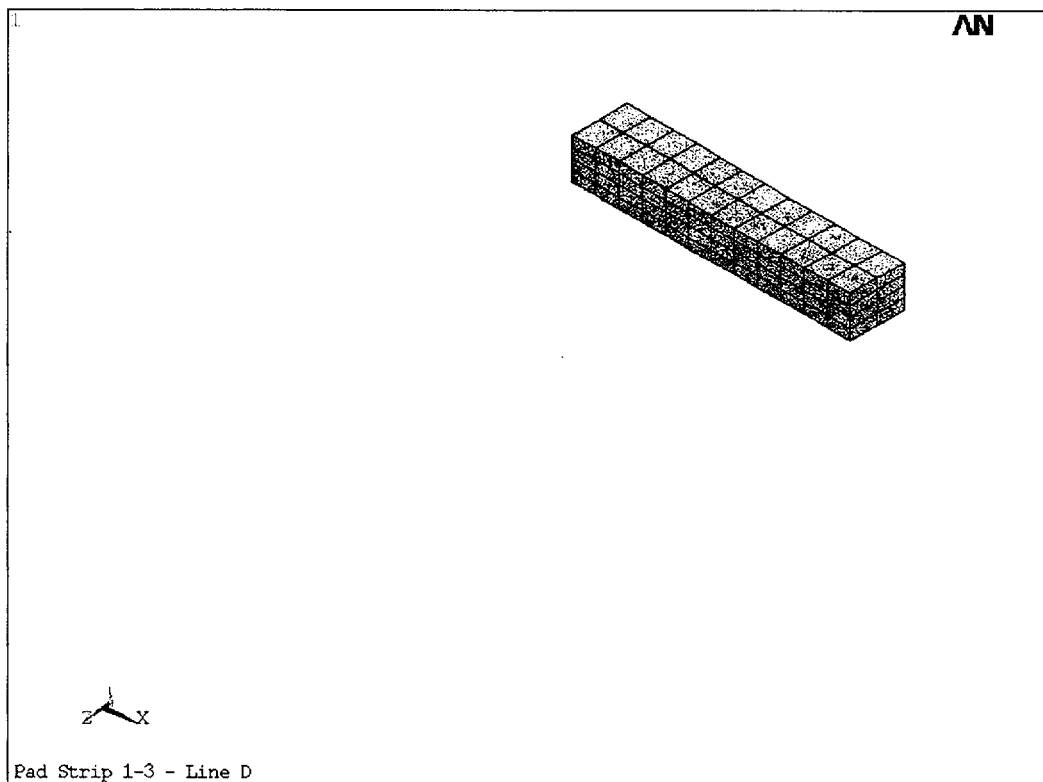
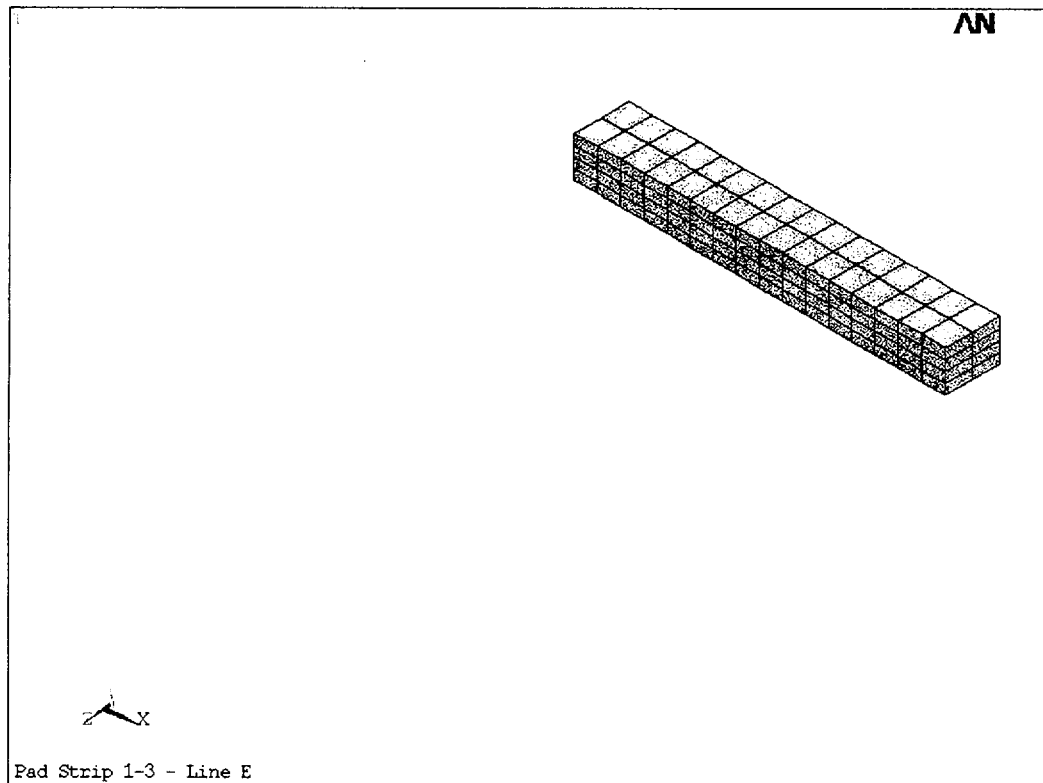






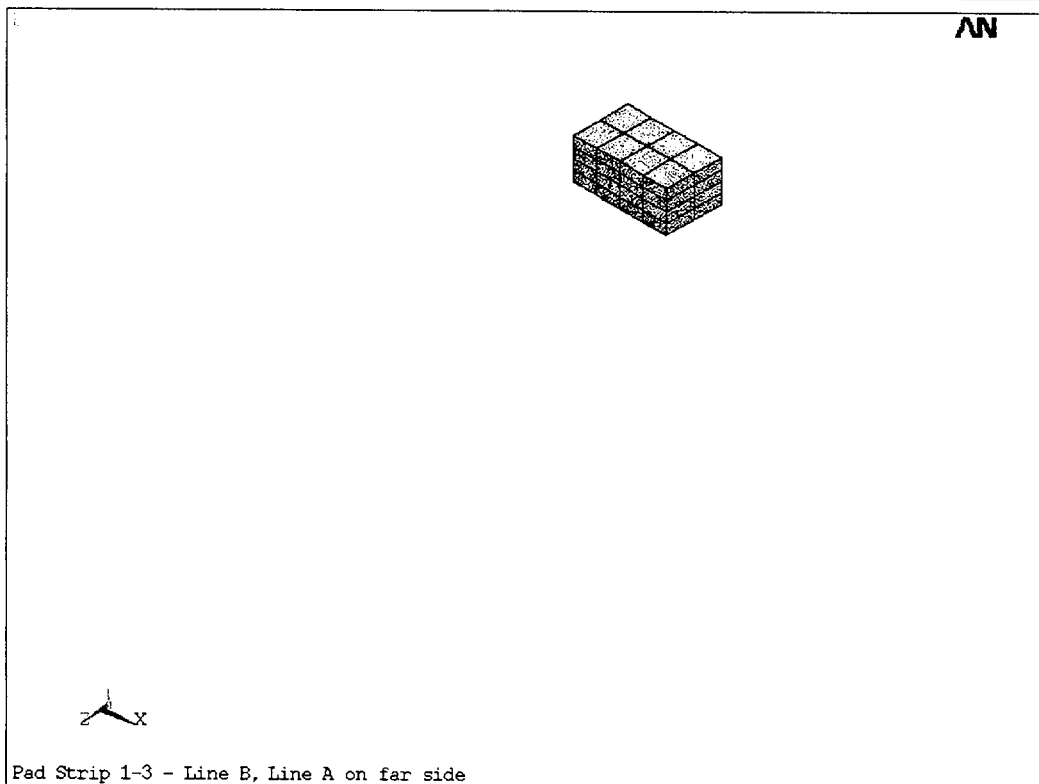
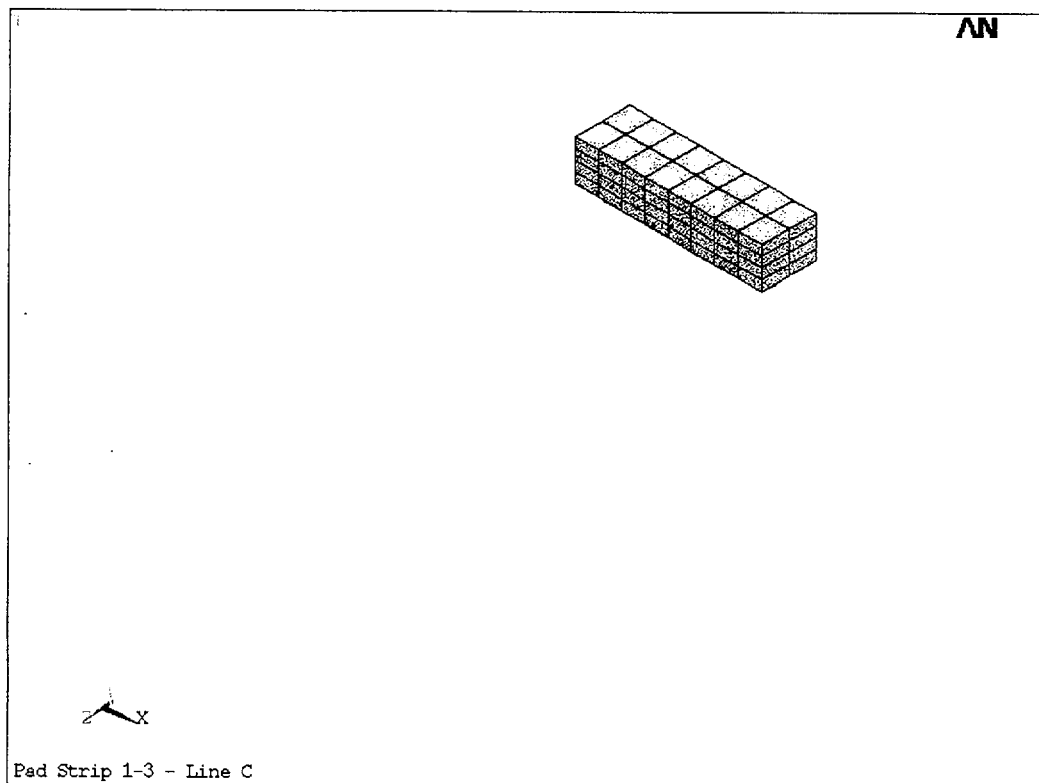
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Appendix MD-4 to Calculation PGE-009-CALC-003





Appendix MD-4 to Calculation PGE-009-CALC-003

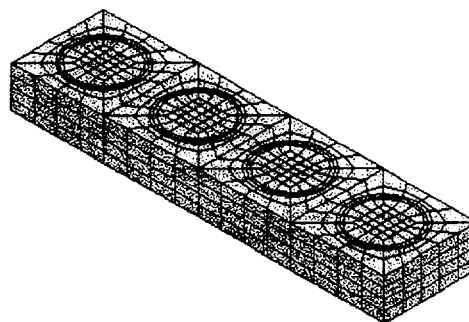




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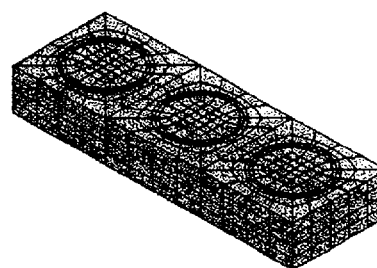
Appendix MD-4 to Calculation PGE-009-CALC-003

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Pad Strip 3-4 - Line E

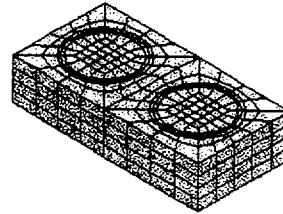
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Pad Strip 3-4 - Line D

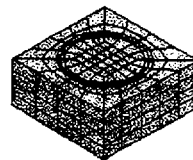


AN



Pad Strip 3-4 - Line C

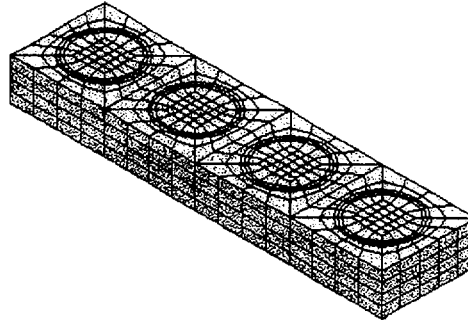
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Pad Strip 3-4 - Line B, Line A on far side

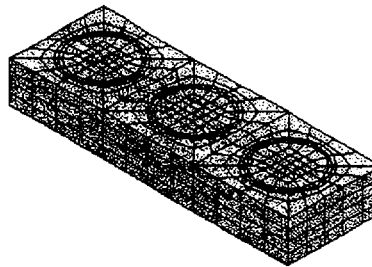


AN



Ped Strip 4-5 - Line E

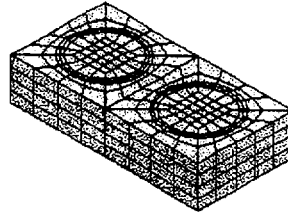
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Ped Strip 4-5 - Line D

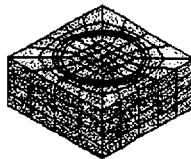


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Pad Strip 4-5 - Line C

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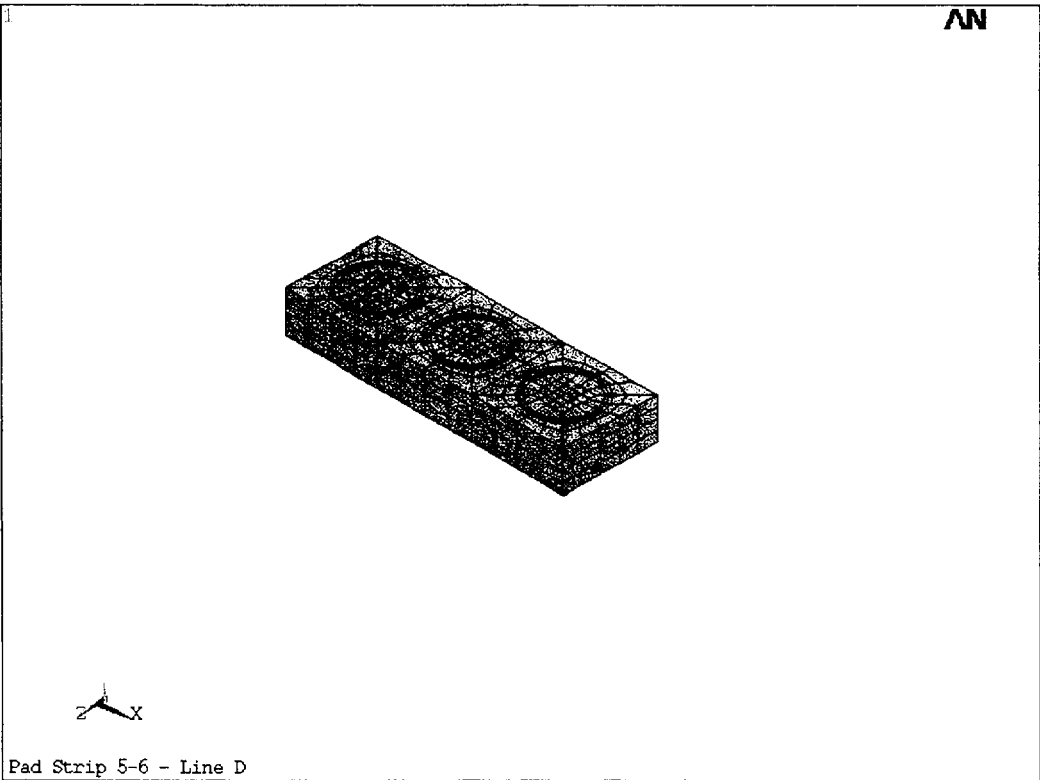
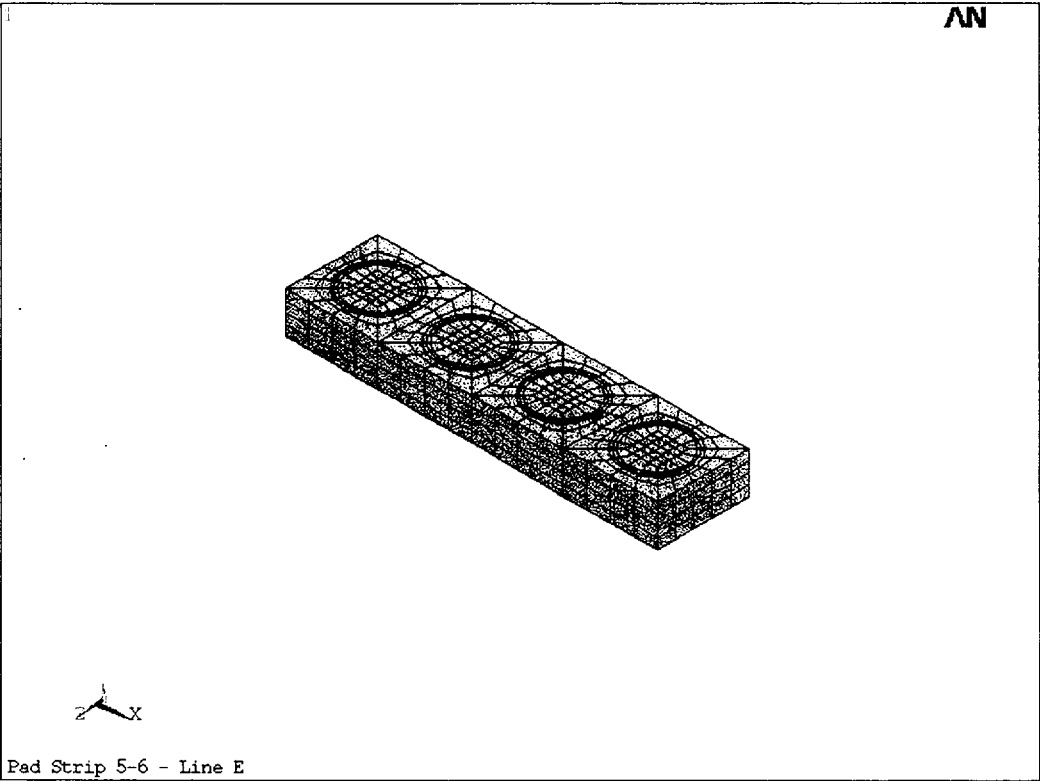


Pad Strip 4-5 - Line B, Line A on far side



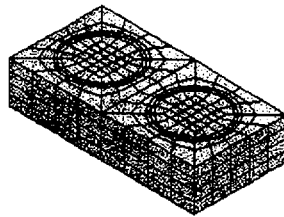
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Appendix MD-4 to Calculation PGE-009-CALC-003



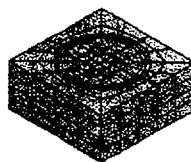


AN



Pad Strip 5-6 - Line C

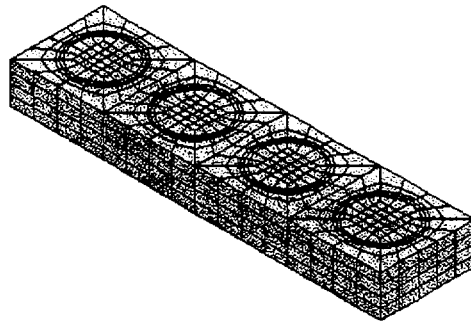
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Pad Strip 5-6 - Line B, Line A on far side

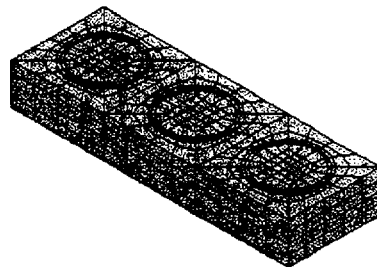


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Pad Strip 6-7 - Line E

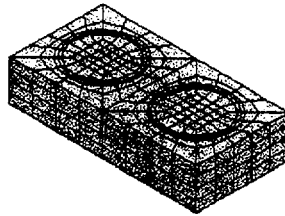
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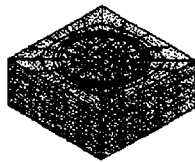


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Pad Strip 6-7 - Line C

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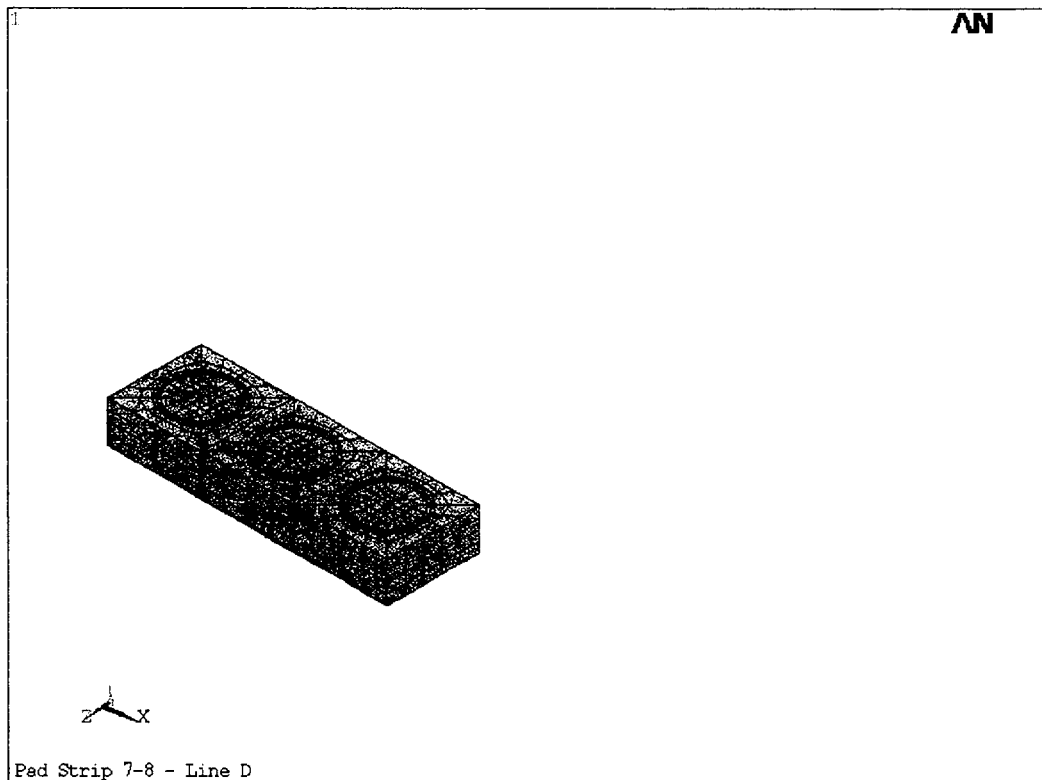
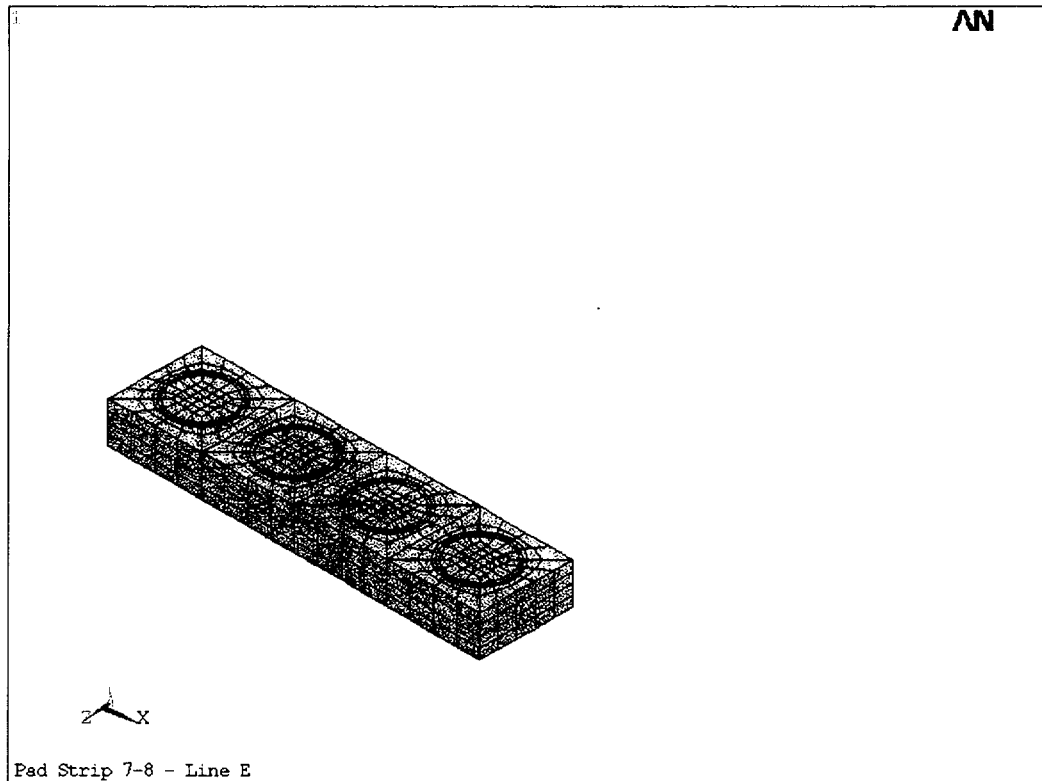


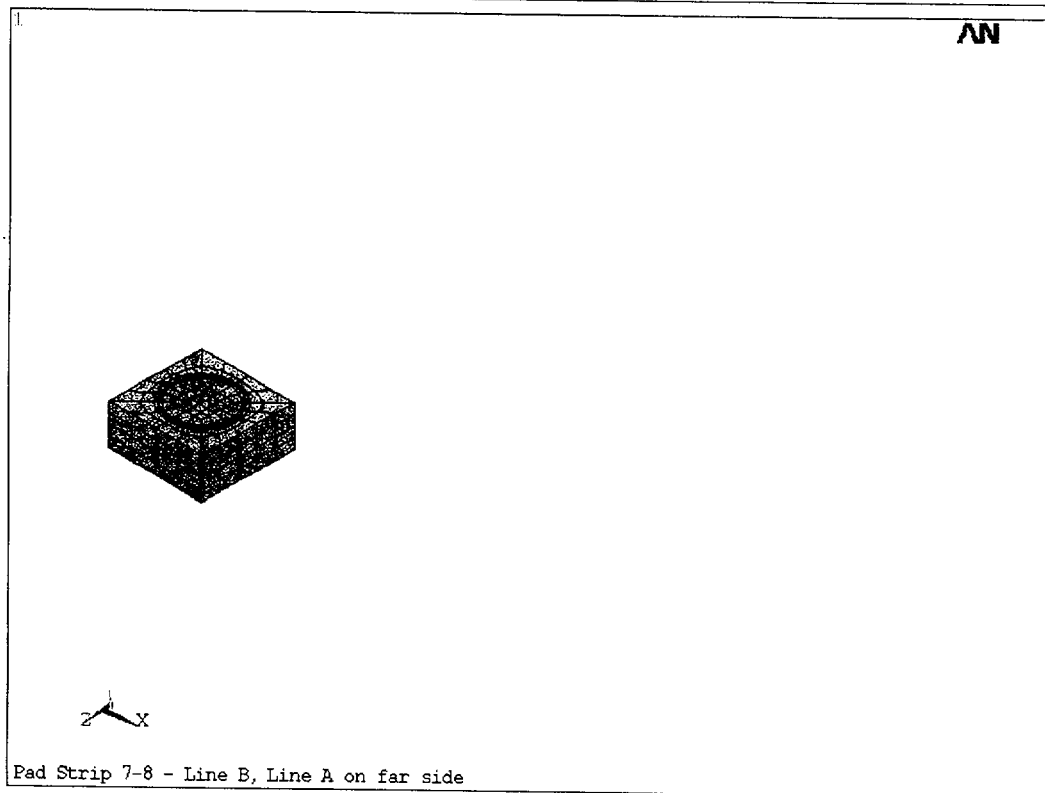
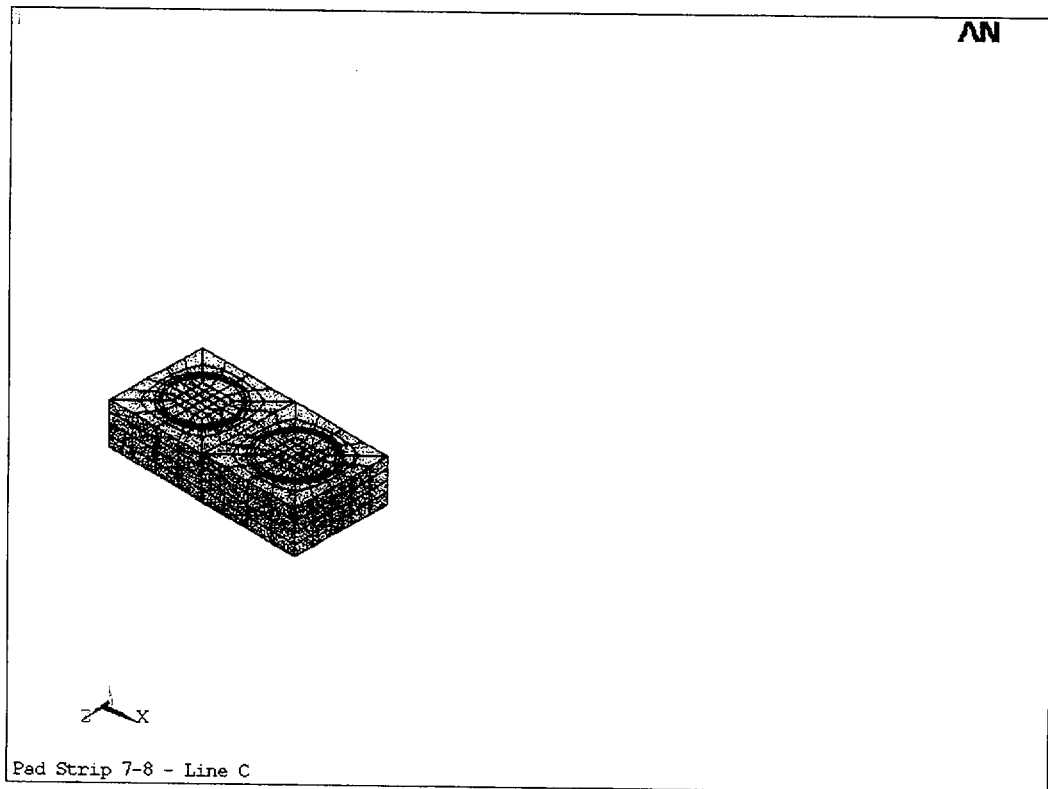
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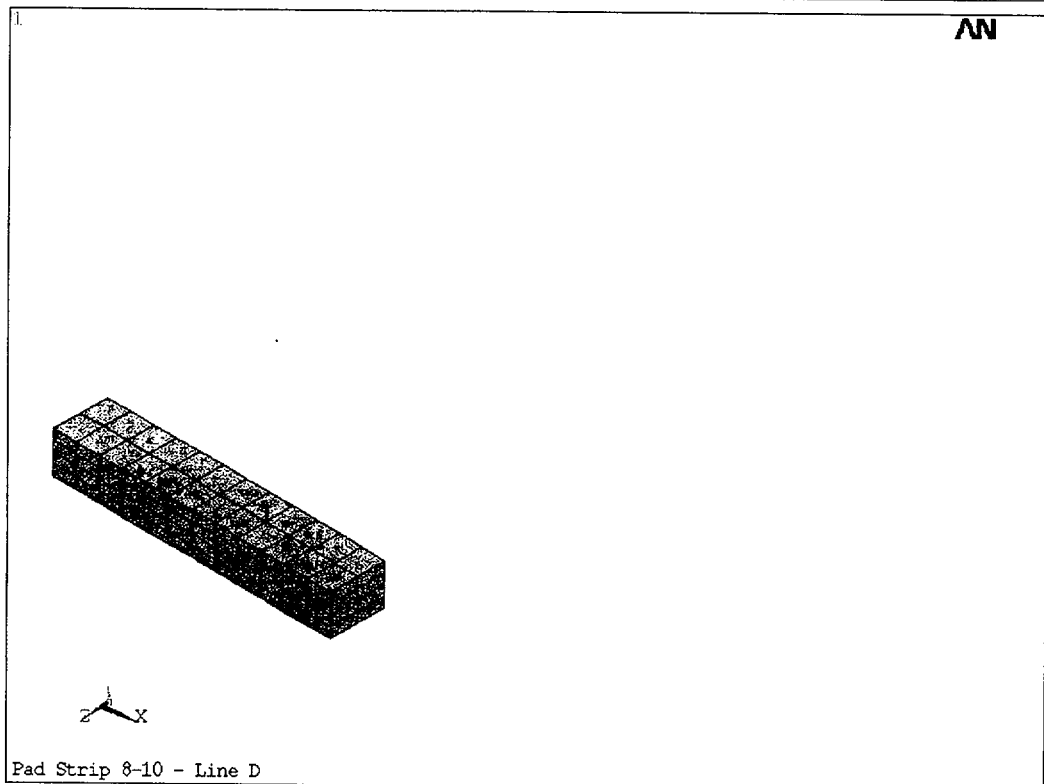
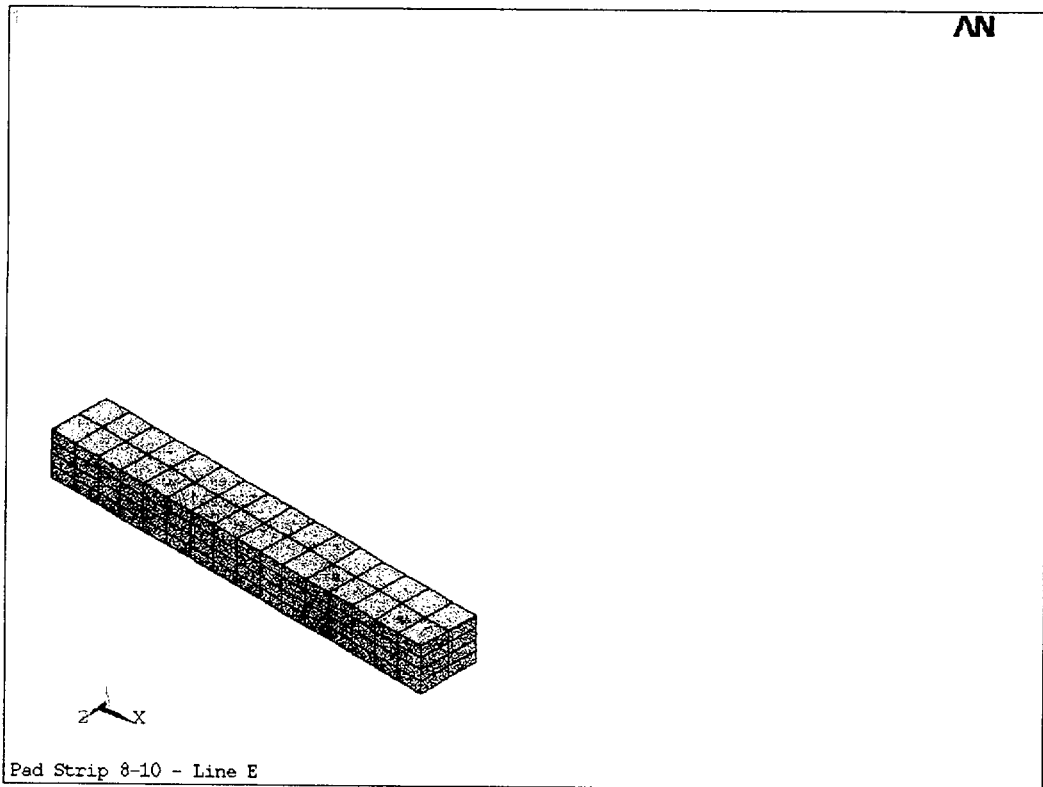


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Appendix MD-4 to Calculation PGE-009-CALC-003

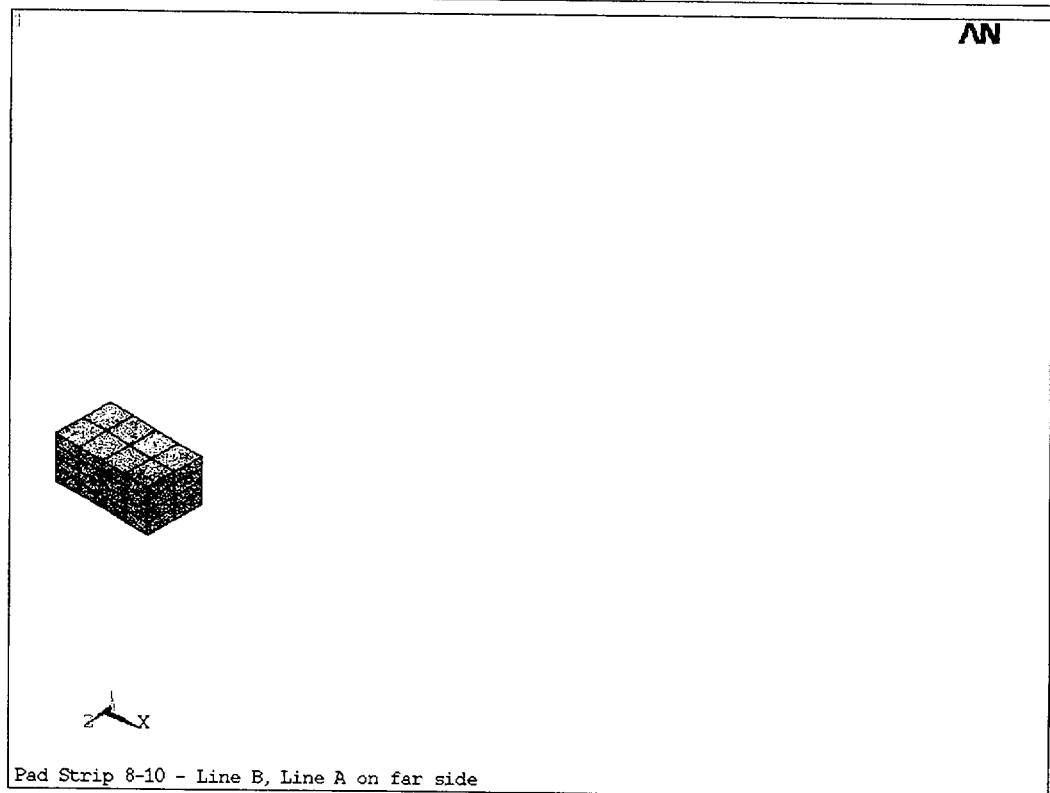
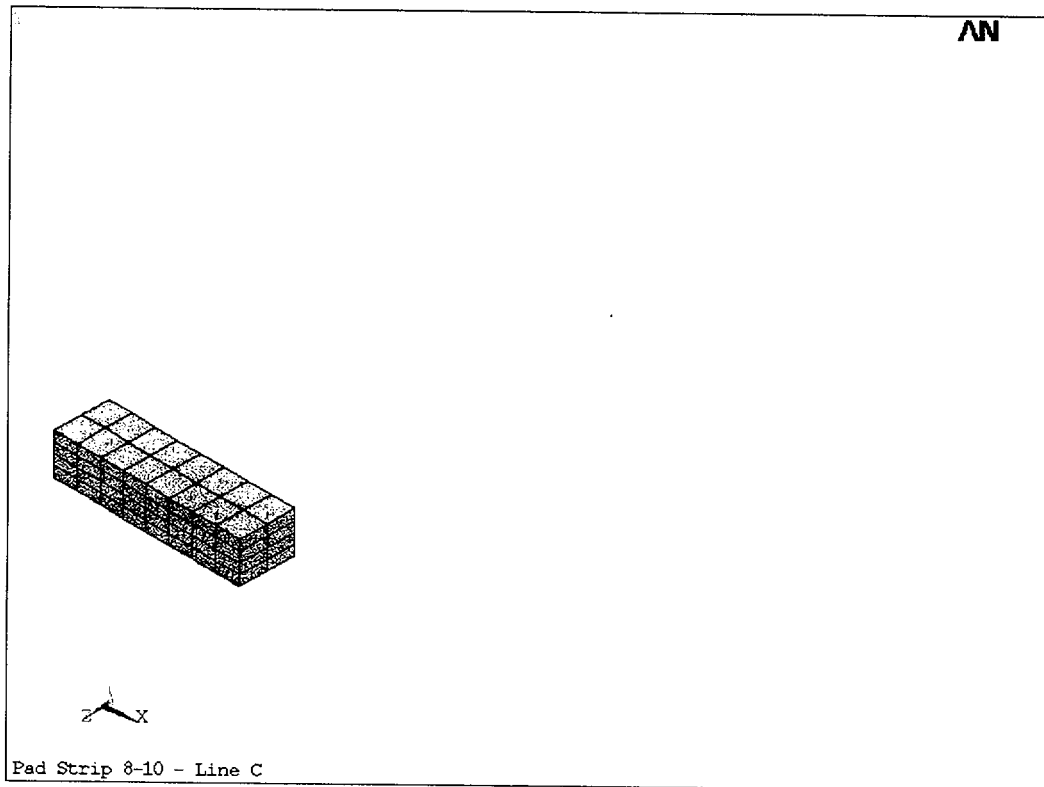








Appendix MD-4 to Calculation PGE-009-CALC-003




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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
```



**ENERCON
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Appendix MD-4 to Calculation PGE-009-CALC-003

```

eplo
nset,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
nset,r,loc,z,-1038.1,-713.9
enode,1
/title,Pad Strip A-B - Line 4
eplo
nset,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
nset,r,loc,z,-1038.1,-917.9
enode,1
/title,Pad Strip A-B - Line 3
eplo
nset,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
nset,r,loc,z,-1038.1,-977.9
enode,1
/title,Pad Strip A-B - Line 2, Line 1 on far side
eplo
nset,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
nset,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
nset,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
```



**ENERCON
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Appendix MD-4 to Calculation PGE-009-CALC-003

```

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
```



```
nset,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
nset,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
nset,r,loc,z,-1038.1,162.1
enode,1
/title,Pad Strip D-E - Line 9
eplo
nset,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
nset,r,loc,z,-1038.1,102.1
enode,1
/title,Pad Strip D-E - Line 8
eplo
nset,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
nset,r,loc,z,-1038.1,-101.9
enode,1
/title,Pad Strip D-E - Line 7
eplo
nset,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
nset,r,loc,z,-1038.1,-305.9
enode,1
/title,Pad Strip D-E - Line 6
eplo
nset,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
```




**ENERCON
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Appendix MD-4 to Calculation PGE-009-CALC-003

```

/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

```



Appendix MD-4 to Calculation PGE-009-CALC-003

```
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
```



Appendix MD-4 to Calculation PGE-009-CALC-003

```
/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
```



```
nset,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
nset,r,loc,x,-102.1,102.1
enode,1
/title,Pad Strip 6-7 - Line B, Line A on far side
eplo
nset,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
nset,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
nset,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
nset,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
nset,r,loc,x,-102.1,510.1
enode,1
/title,Pad Strip 7-8 - Line D
eplo
nset,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
```




**ENERCON
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Appendix MD-4 to Calculation PGE-009-CALC-003

```

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

$$\begin{aligned} F_x &= 0 \\ F_y &= 360000*20 = 7200000 \\ F_z &= 0 \end{aligned}$$

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

$$\begin{aligned} F_x &= 0 \\ F_y &= 360000*20 + 8032500 = 15232500 \\ F_z &= 0 \end{aligned}$$

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

Sum of Applied Loads

$$\begin{aligned} F_x &= 0 \\ F_y &= 267040*20 = 5340800 \\ F_z &= 515000*20 = 10300000 \end{aligned}$$

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

$$\begin{aligned} F_x &= 0 \\ F_y &= 267040*20 + 0.800*8032500 = 11766800 \\ F_z &= 515000*20 + 0.808*8032500 = 16790260 \end{aligned}$$

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

Sum of Applied Loads

$$\begin{aligned} F_x &= 279961*20 = 5599220 \\ F_y &= 267040*20 = 5340800 \\ F_z &= 432258*20 = 8645160 \end{aligned}$$

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

$$\begin{aligned} F_x &= 279961*20 + 0.439 *8032500 = 9125488 \\ F_y &= 267040*20 + 0.800*8032500 = 11766800 \end{aligned}$$



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Appendix RL-1 to Calculation PGE-009-CALC-003

$$F_z = 432258*20 + 0.678*8032500 = 14091195$$

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

Sum of Applied Loads

$$F_x = 364160*20 = 7283200$$

$$F_y = 267040*20 = 5340800$$

$$F_z = 364160*20 = 7283200$$

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

$$F_x = 364160*20 + 0.571*8032500 = 11869758$$

$$F_y = 267040*20 + 0.800*8032500 = 11766800$$

$$F_z = 364160*20 + 0.571*8032500 = 11869758$$

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

Sum of Applied Loads

$$F_x = 432258*20 = 8645160$$

$$F_y = 267040*20 = 5340800$$

$$F_z = 279961*20 = 5599220$$

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

$$F_x = 432258*20 + 0.678*8032500 = 14091195$$

$$F_y = 267040*20 + 0.800*8032500 = 11766800$$

$$F_z = 279961*20 + 0.439*8032500 = 9125488$$

Load Step 6 - Apply in the West direction

Sum of Applied Loads

$$F_x = 515000*20 = 10300000$$

$$F_y = 267040*20 = 5340800$$

$$F_z = 0$$

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

$$F_x = 515000*20 + 0.808*8032500 = 16790260$$

$$F_y = 267040*20 + 0.800*8032500 = 11766800$$

$$F_z = 0$$



Load Step 7 - Apply in the North direction

Sum of Applied Loads

$$\begin{aligned} F_x &= 0 \\ F_y &= 127600 * 20 = 2552000 \\ F_z &= 206000 * 20 = 4120000 \end{aligned}$$

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

$$\begin{aligned} F_x &= 0 \\ F_y &= 127600 * 20 + 0.500 * 8032500 = 6568250 \\ F_z &= 206000 * 20 + 0.424 * 8032500 = 7525780 \end{aligned}$$

Load Step 8 - Apply in the West direction:

Sum of Applied Loads

$$\begin{aligned} F_x &= 206000 * 20 = 4120000 \\ F_y &= 127600 * 20 = 2552000 \\ F_z &= 0 \end{aligned}$$

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

$$\begin{aligned} F_x &= 206000 * 20 + 0.424 * 8032500 = 7525780 \\ F_y &= 127600 * 20 + 0.500 * 8032500 = 6568250 \\ F_z &= 0 \end{aligned}$$

Load Step 9 - Apply in the North direction:

Sum of Applied Loads

$$\begin{aligned} F_x &= 0 \\ F_y &= 773300 * 20 = 15466000 \\ F_z &= 171200 * 20 = 3424000 \end{aligned}$$

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

$$\begin{aligned} F_x &= 0 \\ F_y &= 773300 * 20 + 1.500 * 8032500 = 27514750 \\ F_z &= 171200 * 20 + 0.424 * 8032500 = 6829780 \end{aligned}$$

Load Step 10 - Apply in the West direction:



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Appendix RL-1 to Calculation PGE-009-CALC-003

Sum of Applied Loads

$$\begin{aligned} F_x &= 171200 * 20 &= 3424000 \\ F_y &= 773300 * 20 &= 15466000 \\ F_z & &= 0 \end{aligned}$$

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

$$\begin{aligned} F_x &= 171200 * 20 + 0.424 * 8032500 &= 6829780 \\ F_y &= 773300 * 20 + 1.500 * 8032500 &= 27514750 \\ F_z & &= 0 \end{aligned}$$

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

Sum of Applied Loads

$$\begin{aligned} F_x & &= 0 \\ F_y &= 258320 * 20 &= 5166400 \\ F_z &= 440000 * 20 &= 8800000 \end{aligned}$$

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

$$\begin{aligned} F_x & &= 0 \\ F_y &= 258320 * 20 + 0.720 * 8032500 &= 10949800 \\ F_z &= 440000 * 20 + 0.894 * 8032500 &= 15981055 \end{aligned}$$

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

Sum of Applied Loads

$$\begin{aligned} F_x &= 239190 * 20 &= 4783800 \\ F_y &= 258320 * 20 &= 5166400 \\ F_z &= 369308 * 20 &= 7386160 \end{aligned}$$

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

$$\begin{aligned} F_x &= 239190 * 20 + 0.486 * 8032500 &= 8687595 \\ F_y &= 258320 * 20 + 0.720 * 8032500 &= 10949800 \\ F_z &= 369308 * 20 + 0.750 * 8032500 &= 13410535 \end{aligned}$$

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

Sum of Applied Loads



Appendix RL-1 to Calculation PGE-009-CALC-003

$$\begin{aligned} F_x &= 311127*20 &= 6222540 \\ F_y &= 258320*20 &= 5166400 \\ F_z &= 311127*20 &= 6222540 \end{aligned}$$

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

$$\begin{aligned} F_x &= 311127*20 + 0.632*8032500 &= 11299080 \\ F_y &= 258320*20 + 0.720*8032500 &= 10949800 \\ F_z &= 311127*20 + 0.632*8032500 &= 11299080 \end{aligned}$$

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

Sum of Applied Loads

$$\begin{aligned} F_x &= 369308*20 &= 7386160 \\ F_y &= 258320*20 &= 5166400 \\ F_z &= 239190*20 &= 4783800 \end{aligned}$$

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

$$\begin{aligned} F_x &= 369308*20 + 0.750*8032500 &= 13410535 \\ F_y &= 258320*20 + 0.720*8032500 &= 10949800 \\ F_z &= 239190*20 + 0.486*8032500 &= 8687595 \end{aligned}$$

Load Step 15 - Apply in the West direction:

Sum of Applied Loads

$$\begin{aligned} F_x &= 440000*20 &= 8800000 \\ F_y &= 258320*20 &= 5166400 \\ F_z & &= 0 \end{aligned}$$

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

$$\begin{aligned} F_x &= 440000*20 + 0.894*8032500 &= 15981055 \\ F_y &= 258320*20 + 0.720*8032500 &= 10949800 \\ F_z & &= 0 \end{aligned}$$

Load Step 16 - Apply in the North direction:

Sum of Applied Loads

$$\begin{aligned} F_x & &= 0 \\ F_y &= 105800*20 &= 2116000 \end{aligned}$$



$$F_z = 176000 * 20 = 3520000$$

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

$$F_x = 0$$

$$F_y = 105800 * 20 + 0.300 * 8032500 = 4525750$$

$$F_z = 176000 * 20 + 0.470 * 8032500 = 7295275$$

Load Step 17 - Apply in the West direction:

Sum of Applied Loads

$$F_x = 176000 * 20 = 3520000$$

$$F_y = 105800 * 20 = 2116000$$

$$F_z = 0$$

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

$$F_x = 176000 * 20 + 0.470 * 8032500 = 7295275$$

$$F_y = 105800 * 20 + 0.300 * 8032500 = 4525750$$

$$F_z = 0$$

Load Step 18 - Apply in the North direction:

Sum of Applied Loads

$$F_x = 0$$

$$F_y = 55600 * 20 = 1112000$$

$$F_z = 156000 * 20 = 3120000$$

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

$$F_x = 0$$

$$F_y = 55600 * 20 + 0.300 * 8032500 = 3521750$$

$$F_z = 156000 * 20 + 0.470 * 8032500 = 6895275$$

Load Step 19 - Apply in the West direction:

Sum of Applied Loads

$$F_x = 156000 * 20 = 3120000$$

$$F_y = 55600 * 20 = 1112000$$

$$F_z = 0$$



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

$$F_x = 156000 \cdot 20 + 0.470 \cdot 8032500 = 6895275$$

$$F_y = 55600 \cdot 20 + 0.300 \cdot 8032500 = 3521750$$

$$F_z = 0$$



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

Appendix RL-1 to Calculation PGE-009-CALC-003

```

/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 *****

```



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Appendix RL-1 to Calculation PGE-009-CALC-003

```
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 *****
```



Appendix RL-1 to Calculation PGE-009-CALC-003

```
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
```



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Appendix RL-1 to Calculation PGE-009-CALC-003

```

/com
/com
/com *****
/com *****
/com ***** LOAD CASE 10 *****
set,10
eall
cmsel,s,cask
/com
/com ***** SUM OF LOADS APPLIED TO CASKS *****
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/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 ***** LOAD CASE 12 *****
set,12
eallr
cmsel,s,cask
/com

```



Appendix RL-1 to Calculation PGE-009-CALC-003

```
/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 ***** 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
```



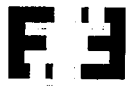
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Appendix RL-1 to Calculation PGE-009-CALC-003

```

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 ***** 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

```

Appendix RL-1 to Calculation PGE-009-CALC-003

```
/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 ***** LOAD CASE 19 *****
set,19
eallr
```



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Appendix RL-1 to Calculation PGE-009-CALC-003

```

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

```

Appendix RL-1 to Calculation PGE-009-CALC-003

```

/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

```



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Appendix RL-1 to Calculation PGE-009-CALC-003

```

/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 ***** 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 *****

```



Appendix RL-1 to Calculation PGE-009-CALC-003

```
/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
```



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Appendix RL-1 to Calculation PGE-009-CALC-003

```

/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

```



Appendix RL-1 to Calculation PGE-009-CALC-003

```
/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 ***** LOAD CASE 14 *****
set,14
eallr
cmsel,s,cask
/com
```



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Appendix RL-1 to Calculation PGE-009-CALC-003

```

/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 ***** 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 ***** 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

```



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Appendix RL-1 to Calculation PGE-009-CALC-003

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

Appendix RL-1 to Calculation PGE-009-CALC-003

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



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Appendix RL-1 to Calculation PGE-009-CALC-003

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



Appendix RL-1 to Calculation PGE-009-CALC-003

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



Appendix RL-1 to Calculation PGE-009-CALC-003

***** 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



Appendix RL-1 to Calculation PGE-009-CALC-003

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



Appendix RL-1 to Calculation PGE-009-CALC-003

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



Appendix RL-1 to Calculation PGE-009-CALC-003

***** 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 *****



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Appendix RL-1 to Calculation PGE-009-CALC-003

```
***** 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
```



Appendix RL-1 to Calculation PGE-009-CALC-003

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.



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Appendix RL-1 to Calculation PGE-009-CALC-003

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.



Appendix RL-1 to Calculation PGE-009-CALC-003

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



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Appendix RL-1 to Calculation PGE-009-CALC-003

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



Appendix RL-1 to Calculation PGE-009-CALC-003

***** 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



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Appendix RL-1 to Calculation PGE-009-CALC-003

***** 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



Appendix RL-1 to Calculation PGE-009-CALC-003

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



Appendix RL-1 to Calculation PGE-009-CALC-003

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



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Appendix RL-1 to Calculation PGE-009-CALC-003

***** 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 *****



Appendix RL-1 to Calculation PGE-009-CALC-003

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



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Appendix RL-1 to Calculation PGE-009-CALC-003

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



Appendix RL-1 to Calculation PGE-009-CALC-003

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



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Appendix RL-1 to Calculation PGE-009-CALC-003

***** 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



Appendix RL-1 to Calculation PGE-009-CALC-003

***** 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



Appendix RL-1 to Calculation PGE-009-CALC-003

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



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Appendix RL-1 to Calculation PGE-009-CALC-003

Below are the equilibrium results for the hard rock analyses:

```
*****
*****
*****
*****
*****
*****
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***** Hard Rock Reactions *****
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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



Appendix RL-1 to Calculation PGE-009-CALC-003

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



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Appendix RL-1 to Calculation PGE-009-CALC-003

***** 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



Appendix RL-1 to Calculation PGE-009-CALC-003

***** 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



Appendix RL-1 to Calculation PGE-009-CALC-003

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



Appendix RL-1 to Calculation PGE-009-CALC-003

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 *****



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Appendix RL-1 to Calculation PGE-009-CALC-003

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



Appendix RL-1 to Calculation PGE-009-CALC-003

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



Appendix RL-1 to Calculation PGE-009-CALC-003

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.



Appendix RL-1 to Calculation PGE-009-CALC-003

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.



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Appendix RL-1 to Calculation PGE-009-CALC-003

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

Appendix RL-1 to Calculation PGE-009-CALC-003

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 *****



Appendix RL-1 to Calculation PGE-009-CALC-003

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



Appendix RL-1 to Calculation PGE-009-CALC-003

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



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Appendix RL-1 to Calculation PGE-009-CALC-003

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



Appendix RL-1 to Calculation PGE-009-CALC-003

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



Appendix RL-1 to Calculation PGE-009-CALC-003

***** 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.



Appendix RL-1 to Calculation PGE-009-CALC-003

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



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Appendix RL-1 to Calculation PGE-009-CALC-003

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



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Appendix RL-1 to Calculation PGE-009-CALC-003

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



Appendix RL-1 to Calculation PGE-009-CALC-003

***** 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.



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Appendix RL-1 to Calculation PGE-009-CALC-003

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



Appendix RL-1 to Calculation PGE-009-CALC-003

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



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Appendix RL-1 to Calculation PGE-009-CALC-003

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 ***** LOAD CASE 2 *****
set,2
eall
cmsel,s,cask
```



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Appendix RL-1 to Calculation PGE-009-CALC-003

```

/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 ***** LOAD CASE 12 *****
set,12
eallr
cmsel,s,cask
```



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Appendix RL-1 to Calculation PGE-009-CALC-003

```

/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 ***** 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 ***** 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 ***** 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
```



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Appendix RL-1 to Calculation PGE-009-CALC-003

```

/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 ***** 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 ***** 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
```



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Appendix RL-1 to Calculation PGE-009-CALC-003

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



Appendix RL-1 to Calculation PGE-009-CALC-003

***** 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



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Appendix RL-1 to Calculation PGE-009-CALC-003

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



Appendix RL-1 to Calculation PGE-009-CALC-003

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 *****



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Appendix RL-1 to Calculation PGE-009-CALC-003

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



Appendix RL-1 to Calculation PGE-009-CALC-003

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



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Appendix RL-1 to Calculation PGE-009-CALC-003

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



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Appendix RL-1 to Calculation PGE-009-CALC-003

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



Appendix RL-1 to Calculation PGE-009-CALC-003

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 *****



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Appendix RL-1 to Calculation PGE-009-CALC-003

***** 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 *****



Appendix RL-1 to Calculation PGE-009-CALC-003

```
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
```



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Appendix RL-1 to Calculation PGE-009-CALC-003

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



Appendix RL-1 to Calculation PGE-009-CALC-003

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 *****



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Appendix RL-1 to Calculation PGE-009-CALC-003

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

Appendix RL-1 to Calculation PGE-009-CALC-003

```

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

```



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Appendix RL-1 to Calculation PGE-009-CALC-003

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

Appendix RL-1 to Calculation PGE-009-CALC-003

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



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Appendix RL-1 to Calculation PGE-009-CALC-003

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



Appendix RL-1 to Calculation PGE-009-CALC-003

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



Appendix RL-1 to Calculation PGE-009-CALC-003

***** 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.



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Appendix RL-1 to Calculation PGE-009-CALC-003

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.