APPENDIX A

```
ANSYS Multiphysics


*------------------------------------------------------------------*
|                                                                  |
|   W E L C O M E   T O   T H E   A N S Y S   P R O G R A M        |
|                                                                  |
*------------------------------------------------------------------*



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

                  Completing ANSYS Load Process.


        *****  ANSYS COMMAND LINE ARGUMENTS  *****
 BATCH MODE REQUESTED         = NOLIST
   2 PARALLEL CPUS REQUESTED
```

```
 MEMORY REQUESTED (MB)        = 550
 START-UP FILE MODE           = NOREAD
 STOP FILE MODE               = NOREAD
 DATABASE SIZE REQUESTED (MB) = 500

*** WARNING ***                          CP =       0.671   TIME= 00:29:47
Use of the -M switch is no longer recommended for normal ANSYS use.
ANSYS now dynamically allocates memory as needed.  Only use the -M
switch if you are certain that you need to do so.

 PARAMETER STATUS-           (   1 PARAMETERS DEFINED)
                 (INCLUDING     1 INTERNAL PARAMETERS)

 00185409          VERSION=INTEL NT        RELEASE= 11.0     UP20070125
 CURRENT JOBNAME=file  00:29:47  MAY 07, 2009 CP=      0.671


 PARAMETER _DS_PROGRESS =     999.0000000

 /INPUT FILE= ds.dat  LINE=       0



 *GET  _WALLSTRT  FROM  ACTI  ITEM=TIME WALL  VALUE= 0.496388889
 --- Data in consistent MKS units.

 MKS UNITS SPECIFIED FOR INTERNAL
  LENGTH        (l)  = METER (M)
  MASS          (M)  = KILOGRAM (KG)
  TIME          (t)  = SECOND (SEC)
  TEMPERATURE   (T)  = CELSIUS (C)
  TOFFSET            = 273.0
  CHARGE        (Q)  = COULOMB
  FORCE         (f)  = NEWTON (N) (KG-M/SEC2)
  HEAT               = JOULE (N-M)

  PRESSURE           = PASCAL (NEWTON/M**2)
  ENERGY        (W)  = JOULE (N-M)
  POWER         (P)  = WATT (N-M/SEC)
  CURRENT       (i)  = AMPERE (COULOMBS/SEC)
  CAPACITANCE   (C)  = FARAD
  INDUCTANCE    (L)  = HENRY
  MAGNETIC FLUX      = WEBER
  RESISTANCE    (R)  = OHM
  ELECTRIC POTENTIAL = VOLT

 INPUT  UNITS ARE ALSO SET TO MKS

 *****TRACK MONITOR LEVEL= -1
      TRACK PRINT LEVEL  =  0
      TRACK SUMMARY LEVEL=  0
1

 ***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 11.0     *****
 ANSYS Multiphysics
 00185409          VERSION=INTEL NT      00:29:47  MAY 07, 2009 CP=      0.686



          ***** ANSYS ANALYSIS DEFINITION (PREP7) *****
 *********** Nodes for the whole assembly ***********
 *********** Elements for Part 1 ***********
 *********** Send Materials ***********
 *********** Fixed Supports ***********
 *********** Define Pressure Vector Using Surface Effect Elements ***********
 *********** Define Pressure Vector Using Surface Effect Elements ***********
 *********** Define Pressure Vector Using Surface Effect Elements ***********
 *********** Define Pressure Vector Using Surface Effect Elements ***********
 *********** Define Pressure Vector Using Surface Effect Elements ***********
 *********** Define Pressure Vector Using Surface Effect Elements ***********
```

```
********** Define Pressure Vector Using Surface Effect Elements **********
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********** Define Pressure Vector Using Surface Effect Elements **********
********** Define Pressure Vector Using Surface Effect Elements **********
********** Define Pressure Vector Using Surface Effect Elements **********
********** Define Pressure Vector Using Surface Effect Elements **********
********** Define Pressure Vector Using Surface Effect Elements **********
********** Define Pressure Vector Using Surface Effect Elements **********
********** Define Pressure Vector Using Surface Effect Elements **********
********** Set Reference Temperature **********
********** Define Rotational Velocity **********
********** Send User Defined Coordinate System(s) **********


***** ROUTINE COMPLETED *****  CP =         7.753


--- Number of total nodes = 358727
--- Number of contact elements = 16492
--- Number of spring elements = 0
--- Number of solid elements = 224941
--- Number of total elements = 241433

*GET  _WALLBSOL  FROM  ACTI  ITEM=TIME WALL  VALUE= 0.498333333
*******************************************************************************
************************    SOLUTION       ********************************
*******************************************************************************

*****  ANSYS SOLUTION ROUTINE  *****


PERFORM A STATIC ANALYSIS
 THIS WILL BE A NEW ANALYSIS

NEW SOLUTION CONTROL OPTION IS ACTIVATED,
THE FOLLOWING COMMANDS ARE RESET TO NEW DEFAULTS:
AUTOTS, DELTIM, NSUB, CNVTOL, LNSRCH, PRED, NROPT,
TINTP, CUTCONTROL, OPNCONTROL, MONITOR, NEQIT, SSTIF, KBC.

CONTACT TIME PREDICTIONS ARE BASED ON ELEMENT KEYOPT(7) SPECIFIED
 Avg ratio=    0, totalParts=1, thickParts=1, thickPcent=  1

USE PRECONDITIONED CONJUGATE GRADIENT SOLVER
 CONVERGENCE TOLERANCE = 1.00000E-08
 MAXIMUM ITERATION     = NumNode*DofPerNode*  1.0000

MEMORY SAVING OPTION TURNED ON FOR PCG SOLVER

DO NOT SAVE ANY RESTART FILES AT ALL

CONTACT INFORMATION PRINTOUT LEVEL    1

NLDIAG: Nonlinear diagnostics CONT option is set to ON.
        Writing frequence : each ITERATION.
*************************************************
****************** SOLVE FOR LS 1 ****************

SELECT       FOR ITEM=TYPE COMPONENT=
 IN RANGE       2 TO        2 STEP        1

     831  ELEMENTS (OF   241433  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      ALL NODES HAVING ANY ELEMENT IN ELEMENT SET.

    1798 NODES (OF   358727  DEFINED) SELECTED FROM
     831 SELECTED ELEMENTS BY NSLE COMMAND.
```

```
SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 1   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI33X

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 2   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI33Y

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 3   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI33Z

SELECT       FOR ITEM=TYPE COMPONENT=
 IN RANGE       3 TO        3 STEP        1

     806  ELEMENTS (OF   241433  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      ALL NODES HAVING ANY ELEMENT IN ELEMENT SET.

    1755 NODES (OF   358727  DEFINED) SELECTED FROM
     806 SELECTED ELEMENTS BY NSLE COMMAND.

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 1   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI54X

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 2   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI54Y

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 3   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI54Z

SELECT       FOR ITEM=TYPE COMPONENT=
 IN RANGE       4 TO        4 STEP        1

     820  ELEMENTS (OF   241433  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      ALL NODES HAVING ANY ELEMENT IN ELEMENT SET.

    1773 NODES (OF   358727  DEFINED) SELECTED FROM
     820 SELECTED ELEMENTS BY NSLE COMMAND.

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 1   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI67X

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 2   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI67Y

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 3   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI67Z

SELECT       FOR ITEM=TYPE COMPONENT=
 IN RANGE       5 TO        5 STEP        1

     813  ELEMENTS (OF   241433  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      ALL NODES HAVING ANY ELEMENT IN ELEMENT SET.

    1760 NODES (OF   358727  DEFINED) SELECTED FROM
     813 SELECTED ELEMENTS BY NSLE COMMAND.

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 1   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI68X

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 2   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI68Y

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 3   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI68Z

SELECT       FOR ITEM=TYPE COMPONENT=
 IN RANGE       6 TO        6 STEP        1

     835  ELEMENTS (OF   241433  DEFINED) SELECTED BY  ESEL  COMMAND.
```

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

    1804 NODES (OF   358727  DEFINED) SELECTED FROM
     835 SELECTED ELEMENTS BY NSLE COMMAND.

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 1   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI69X

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 2   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI69Y

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 3   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI69Z

SELECT       FOR ITEM=TYPE COMPONENT=
 IN RANGE       7 TO        7 STEP        1

     835  ELEMENTS (OF   241433  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      ALL NODES HAVING ANY ELEMENT IN ELEMENT SET.

    1804 NODES (OF   358727  DEFINED) SELECTED FROM
     835 SELECTED ELEMENTS BY NSLE COMMAND.

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 1   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI70X

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 2   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI70Y

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 3   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI70Z

SELECT       FOR ITEM=TYPE COMPONENT=
 IN RANGE       8 TO        8 STEP        1

     809  ELEMENTS (OF   241433  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      ALL NODES HAVING ANY ELEMENT IN ELEMENT SET.

    1758 NODES (OF   358727  DEFINED) SELECTED FROM
     809 SELECTED ELEMENTS BY NSLE COMMAND.

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 1   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI71X

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 2   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI71Y

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 3   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI71Z

SELECT       FOR ITEM=TYPE COMPONENT=
 IN RANGE       9 TO        9 STEP        1

     820  ELEMENTS (OF   241433  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      ALL NODES HAVING ANY ELEMENT IN ELEMENT SET.

    1773 NODES (OF   358727  DEFINED) SELECTED FROM
     820 SELECTED ELEMENTS BY NSLE COMMAND.

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 1   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI72X

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 2   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI72Y

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 3   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI72Z
```

```
SELECT       FOR ITEM=TYPE COMPONENT=
 IN RANGE      10 TO       10 STEP        1

     831  ELEMENTS (OF   241433  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      ALL NODES HAVING ANY ELEMENT IN ELEMENT SET.

    1798 NODES (OF   358727  DEFINED) SELECTED FROM
     831 SELECTED ELEMENTS BY NSLE COMMAND.

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 1   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI73X

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 2   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI73Y

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 3   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI73Z

SELECT       FOR ITEM=TYPE COMPONENT=
 IN RANGE      11 TO       11 STEP        1

     831  ELEMENTS (OF   241433  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      ALL NODES HAVING ANY ELEMENT IN ELEMENT SET.

    1796 NODES (OF   358727  DEFINED) SELECTED FROM
     831 SELECTED ELEMENTS BY NSLE COMMAND.

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 1   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI74X

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 2   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI74Y

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 3   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI74Z

SELECT       FOR ITEM=TYPE COMPONENT=
 IN RANGE      12 TO       12 STEP        1

     837  ELEMENTS (OF   241433  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      ALL NODES HAVING ANY ELEMENT IN ELEMENT SET.

    1808 NODES (OF   358727  DEFINED) SELECTED FROM
     837 SELECTED ELEMENTS BY NSLE COMMAND.

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 1   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI75X

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 2   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI75Y

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 3   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI75Z

SELECT       FOR ITEM=TYPE COMPONENT=
 IN RANGE      13 TO       13 STEP        1

     877  ELEMENTS (OF   241433  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      ALL NODES HAVING ANY ELEMENT IN ELEMENT SET.

    1906 NODES (OF   358727  DEFINED) SELECTED FROM
     877 SELECTED ELEMENTS BY NSLE COMMAND.

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 1   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI76X
```

```
SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 2   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI76Y

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 3   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI76Z

SELECT       FOR ITEM=TYPE COMPONENT=
 IN RANGE      14 TO       14 STEP        1

     828  ELEMENTS (OF   241433  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      ALL NODES HAVING ANY ELEMENT IN ELEMENT SET.

    1789 NODES (OF   358727  DEFINED) SELECTED FROM
     828 SELECTED ELEMENTS BY NSLE COMMAND.

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 1   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI77X

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 2   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI77Y

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 3   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI77Z

SELECT       FOR ITEM=TYPE COMPONENT=
 IN RANGE      15 TO       15 STEP        1

     831  ELEMENTS (OF   241433  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      ALL NODES HAVING ANY ELEMENT IN ELEMENT SET.

    1798 NODES (OF   358727  DEFINED) SELECTED FROM
     831 SELECTED ELEMENTS BY NSLE COMMAND.

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 1   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI78X

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 2   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI78Y

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 3   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI78Z

SELECT       FOR ITEM=TYPE COMPONENT=
 IN RANGE      16 TO       16 STEP        1

     820  ELEMENTS (OF   241433  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      ALL NODES HAVING ANY ELEMENT IN ELEMENT SET.

    1773 NODES (OF   358727  DEFINED) SELECTED FROM
     820 SELECTED ELEMENTS BY NSLE COMMAND.

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 1   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI79X

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 2   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI79Y

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 3   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI79Z

SELECT       FOR ITEM=TYPE COMPONENT=
 IN RANGE      17 TO       17 STEP        1

     819  ELEMENTS (OF   241433  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      ALL NODES HAVING ANY ELEMENT IN ELEMENT SET.

    1772 NODES (OF   358727  DEFINED) SELECTED FROM
```

```
     819 SELECTED ELEMENTS BY NSLE COMMAND.

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 1   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI80X

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 2   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI80Y

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 3   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI80Z

SELECT       FOR ITEM=TYPE COMPONENT=
 IN RANGE      18 TO       18 STEP        1

     781  ELEMENTS (OF   241433  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      ALL NODES HAVING ANY ELEMENT IN ELEMENT SET.

    1696 NODES (OF   358727  DEFINED) SELECTED FROM
     781 SELECTED ELEMENTS BY NSLE COMMAND.

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 1   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI81X

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 2   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI81Y

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 3   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI81Z

SELECT       FOR ITEM=TYPE COMPONENT=
 IN RANGE      19 TO       19 STEP        1

     820  ELEMENTS (OF   241433  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      ALL NODES HAVING ANY ELEMENT IN ELEMENT SET.

    1773 NODES (OF   358727  DEFINED) SELECTED FROM
     820 SELECTED ELEMENTS BY NSLE COMMAND.

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 1   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI82X

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 2   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI82Y

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 3   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI82Z

SELECT       FOR ITEM=TYPE COMPONENT=
 IN RANGE      20 TO       20 STEP        1

     827  ELEMENTS (OF   241433  DEFINED) SELECTED BY  ESEL  COMMAND.

SELECT      ALL NODES HAVING ANY ELEMENT IN ELEMENT SET.

    1788 NODES (OF   358727  DEFINED) SELECTED FROM
     827 SELECTED ELEMENTS BY NSLE COMMAND.

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 1   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI83X

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 2   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI83Y

SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 3   KVAL = 1
     SET ACCORDING TO TABLE PARAMETER = _LOADVARI83Z

SELECT       FOR ITEM=TYPE COMPONENT=
 IN RANGE      21 TO       21 STEP        1
```

```
     821  ELEMENTS (OF   241433  DEFINED) SELECTED BY  ESEL  COMMAND.

 SELECT      ALL NODES HAVING ANY ELEMENT IN ELEMENT SET.

     1776 NODES (OF   358727  DEFINED) SELECTED FROM
      821 SELECTED ELEMENTS BY NSLE COMMAND.

 SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 1   KVAL = 1
      SET ACCORDING TO TABLE PARAMETER = _LOADVARI84X

 SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 2   KVAL = 1
      SET ACCORDING TO TABLE PARAMETER = _LOADVARI84Y

 SPECIFIED SURFACE LOAD PRES FOR ALL SELECTED ELEMENTS  LKEY = 3   KVAL = 1
      SET ACCORDING TO TABLE PARAMETER = _LOADVARI84Z

 ALL SELECT   FOR ITEM=NODE COMPONENT=
  IN RANGE       1 TO   358727 STEP        1

   358727  NODES (OF   358727  DEFINED) SELECTED BY NSEL  COMMAND.

 ALL SELECT   FOR ITEM=ELEM COMPONENT=
  IN RANGE       1 TO   241433 STEP        1

   241433  ELEMENTS (OF   241433  DEFINED) SELECTED BY  ESEL  COMMAND.

CGOMGX IS SET ACCORDING TO TABLE PARAMETER = _LOADVARI105X
CGOMGY IS SET ACCORDING TO TABLE PARAMETER = _LOADVARI105Y
CGOMGZ IS SET ACCORDING TO TABLE PARAMETER = _LOADVARI105Z
 *********** Send Uniform Temperature Condition ***********

 PRINTOUT RESUMED BY /GOP

 USE       1 SUBSTEPS INITIALLY THIS LOAD STEP FOR ALL  DOFS
 FOR AUTOMATIC TIME STEPPING:
   USE      1 SUBSTEPS AS A MAXIMUM
   USE      1 SUBSTEPS AS A MINIMUM

 TIME=  1.0000

 ERASE THE CURRENT DATABASE OUTPUT CONTROL TABLE.


 WRITE ALL  ITEMS TO THE DATABASE WITH A FREQUENCY OF NONE
   FOR ALL APPLICABLE ENTITIES

 WRITE NSOL ITEMS TO THE DATABASE WITH A FREQUENCY OF ALL
   FOR ALL APPLICABLE ENTITIES

 WRITE RSOL ITEMS TO THE DATABASE WITH A FREQUENCY OF ALL
   FOR ALL APPLICABLE ENTITIES

 WRITE NLOA ITEMS TO THE DATABASE WITH A FREQUENCY OF ALL
   FOR ALL APPLICABLE ENTITIES

 WRITE STRS ITEMS TO THE DATABASE WITH A FREQUENCY OF ALL
   FOR ALL APPLICABLE ENTITIES

 WRITE EPEL ITEMS TO THE DATABASE WITH A FREQUENCY OF ALL
   FOR ALL APPLICABLE ENTITIES

 WRITE EPPL ITEMS TO THE DATABASE WITH A FREQUENCY OF ALL
   FOR ALL APPLICABLE ENTITIES

 WRITE EPTH ITEMS TO THE DATABASE WITH A FREQUENCY OF ALL
   FOR ALL APPLICABLE ENTITIES

 *****  ANSYS SOLVE    COMMAND  *****

 *** NOTE ***                            CP =       9.079   TIME= 00:29:56
 There is no title defined for this analysis.
```

```
 *** WARNING ***                         CP =       9.079   TIME= 00:29:56
 Element shape checking is currently inactive.  Issue SHPP,ON or
 SHPP,WARN to reactivate, if desired.

 *** NOTE ***                            CP =      14.024   TIME= 00:29:58
 The model data was checked and warning messages were found.
  Please review output or errors file ( F:\Academics\Jan09\Final Year
 Project II\6812 Dissertation\hatelokskit Simulation Files\Static
 Structural\file.err ) for these warning messages.

 *** SELECTION OF ELEMENT TECHNOLOGIES FOR APPLICABLE ELEMENTS ***
      --- GIVE SUGGESTIONS AND RESET THE KEY OPTIONS ---

 ELEMENT TYPE    1 IS SOLID187. IT IS NOT ASSOCIATED WITH FULLY INCOMPRESSIBLE
 HYPERELASTIC MATERIALS. NO SUGGESTION IS AVAILABLE AND NO RESETTING IS NEEDED.


1

 ***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 11.0     *****
 ANSYS Multiphysics
 00185409          VERSION=INTEL NT      00:29:59  MAY 07, 2009 CP=     14.180



                     S O L U T I O N   O P T I O N S

   PROBLEM DIMENSIONALITY. . . . . . . . . . . . .3-D
   DEGREES OF FREEDOM. . . . . . UX   UY   UZ
   ANALYSIS TYPE . . . . . . . . . . . . . . . .STATIC (STEADY-STATE)
   EQUATION SOLVER OPTION. . . . . . . . . . . . .PCG
      MEMORY SAVING OPTION. . . .  . . . . . . . .ON
      TOLERANCE. . . . . . . . . . . . . . . . . . 1.00000E-08
   GLOBALLY ASSEMBLED MATRIX . . . . . . . . . . .SYMMETRIC

 *** WARNING ***                         CP =      14.539   TIME= 00:29:59
 Material number 2 (used by element 224942 ) should normally have at
 least one MP or one TB type command associated with it.  Output of
 energy by material may not be available.

 *** NOTE ***                            CP =      15.038   TIME= 00:30:00
 The step data was checked and warning messages were found.
  Please review output or errors file ( F:\Academics\Jan09\Final Year
 Project II\6812 Dissertation\hatelokskit Simulation Files\Static
 Structural\file.err ) for these warning messages.

 *** NOTE ***                            CP =      15.038   TIME= 00:30:00
 The conditions for direct assembly have been met.  No .emat or .erot
 files will be produced.

 *** NOTE ***                            CP =      17.301   TIME= 00:30:02
 The initial memory allocation (-m) has been exceeded.
  Supplemental memory allocations are being used.

                     L O A D   S T E P   O P T I O N S

   LOAD STEP NUMBER. . . . . . . . . . . . . . . .     1
   TIME AT END OF THE LOAD STEP. . . . . . . . . .  1.0000
   NUMBER OF SUBSTEPS. . . . . . . . . . . . . . .     1
   STEP CHANGE BOUNDARY CONDITIONS . . . . . . . .    NO
   INERTIA LOADS                         X           Y           Z
      CGLOC. . . . . . . . . . . .  1.1686      0.0000    -0.62212E-17
      CGOMGA . . . . . . . . . . ._LOADVARI10 _LOADVARI10 _LOADVARI10
   PRINT OUTPUT CONTROLS . . . . . . . . . . . . .NO PRINTOUT
   DATABASE OUTPUT CONTROLS
      ITEM     FREQUENCY   COMPONENT
       ALL       NONE
      NSOL        ALL
      RSOL        ALL
```

NLOA	ALL
STRS	ALL
EPEL	ALL
EPPL	ALL
EPTH	ALL

SOLUTION MONITORING INFO IS WRITTEN TO FILE=
file.mntr

*** NOTE *** CP = 22.152 TIME= 00:30:07
The PCG solver has automatically set the level of difficulty for this model to 1.

**** CENTER OF MASS, MASS, AND MASS MOMENTS OF INERTIA ****

CALCULATIONS ASSUME ELEMENT MASS AT ELEMENT CENTROID

TOTAL MASS = 900.44

CENTER OF MASS	MOM. OF INERTIA ABOUT ORIGIN	MOM. OF INERTIA ABOUT CENTER OF MASS
XC = 0.85994	IXX = 159.2	IXX = 159.2
YC = 0.55632E-05	IYY = 753.3	IYY = 87.47
ZC = -0.13688E-06	IZZ = 753.3	IZZ = 87.47
	IXY = -0.3484E-02	IXY = 0.8240E-03
	IYZ = 0.3039E-02	IYZ = 0.3039E-02
	IZX = 0.7479E-03	IZX = 0.6419E-03

*** MASS SUMMARY BY ELEMENT TYPE ***

TYPE	MASS
1	900.440

Range of element maximum matrix coefficients in global coordinates
Maximum= 2.802522919E+10 at element 55035.
Minimum= 101193590 at element 63734.

*** ELEMENT MATRIX FORMULATION TIMES

TYPE	NUMBER	ENAME	TOTAL CP	AVE CP
1	224941	SOLID187	108.561	0.000483
2	831	SURF154	0.109	0.000131
3	806	SURF154	0.203	0.000252
4	820	SURF154	0.125	0.000152
5	813	SURF154	0.250	0.000307
6	835	SURF154	0.234	0.000280
7	835	SURF154	0.312	0.000374
8	809	SURF154	0.156	0.000193
9	820	SURF154	0.172	0.000209
10	831	SURF154	0.250	0.000300
11	831	SURF154	0.156	0.000188
12	837	SURF154	0.078	0.000093
13	877	SURF154	0.156	0.000178
14	828	SURF154	0.125	0.000151
15	831	SURF154	0.078	0.000094
16	820	SURF154	0.250	0.000304
17	819	SURF154	0.218	0.000267
18	781	SURF154	0.094	0.000120
19	820	SURF154	0.608	0.000742
20	827	SURF154	0.094	0.000113
21	821	SURF154	0.218	0.000266

Time at end of element matrix formulation CP= 80.6837172.
Iteration= 75 Ratio= 2.332659011E-07 Limit= 1.E-08 CP= 139.511694.

```
PRECONDITIONED SOLVER CP TIME      =    67.283
PRECONDITIONED SOLVER ELAPSED TIME =    50.070

*** NOTE ***                            CP =     199.213   TIME= 00:33:18
Page file used.

  *** ELEMENT RESULT CALCULATION TIMES
 TYPE  NUMBER   ENAME      TOTAL CP  AVE CP

    1  224941  SOLID187    129.200   0.000574
    2     831  SURF154       0.359   0.000432
    3     806  SURF154       0.140   0.000174
    4     820  SURF154       0.250   0.000304
    5     813  SURF154       0.281   0.000345
    6     835  SURF154       0.296   0.000355
    7     835  SURF154       0.156   0.000187
    8     809  SURF154       0.109   0.000135
    9     820  SURF154       0.218   0.000266
   10     831  SURF154       0.312   0.000375
   11     831  SURF154       0.109   0.000131
   12     837  SURF154       0.187   0.000224
   13     877  SURF154       0.328   0.000374
   14     828  SURF154       0.281   0.000339
   15     831  SURF154       0.218   0.000263
   16     820  SURF154       0.187   0.000228
   17     819  SURF154       0.156   0.000190
   18     781  SURF154       0.234   0.000300
   19     820  SURF154       0.421   0.000514
   20     827  SURF154       0.218   0.000264
   21     821  SURF154       0.265   0.000323

  *** NODAL LOAD CALCULATION TIMES
 TYPE  NUMBER   ENAME      TOTAL CP  AVE CP

    1  224941  SOLID187      3.978   0.000018
    2     831  SURF154       0.031   0.000038
    3     806  SURF154       0.000   0.000000
    4     820  SURF154       0.000   0.000000
    5     813  SURF154       0.000   0.000000
    6     835  SURF154       0.000   0.000000
    7     835  SURF154       0.000   0.000000
    8     809  SURF154       0.000   0.000000
    9     820  SURF154       0.047   0.000057
   10     831  SURF154       0.000   0.000000
   11     831  SURF154       0.000   0.000000
   12     837  SURF154       0.000   0.000000
   13     877  SURF154       0.062   0.000071
   14     828  SURF154       0.000   0.000000
   15     831  SURF154       0.000   0.000000
   16     820  SURF154       0.000   0.000000
   17     819  SURF154       0.000   0.000000
   18     781  SURF154       0.031   0.000040
   19     820  SURF154       0.000   0.000000
   20     827  SURF154       0.031   0.000038
   21     821  SURF154       0.000   0.000000
*** LOAD STEP     1   SUBSTEP     1  COMPLETED.    CUM ITER =      1
*** TIME =   1.00000         TIME INC =   1.00000      NEW TRIANG MATRIX


*** ANSYS BINARY FILE STATISTICS
 BUFFER SIZE USED= 16384
     617.438 MB WRITTEN ON ELEMENT SAVED DATA FILE: file.esav
     420.438 MB WRITTEN ON RESULTS FILE: file.rst
************************************************
*************** FINISHED SOLVE FOR LS 1 *************

PARAMETER _DS_PROGRESS  DELETED.

*GET  _WALLASOL  FROM  ACTI  ITEM=TIME WALL  VALUE= 0.564166667
```

```
 *GET  _PCGITER  FROM  ACTI  ITEM=SOLU CGIT  VALUE=  89.0000000

 FINISH SOLUTION PROCESSING


 ***** ROUTINE COMPLETED *****  CP =       223.924


1

 ***** ANSYS - ENGINEERING ANALYSIS SYSTEM  RELEASE 11.0     *****
 ANSYS Multiphysics
 00185409          VERSION=INTEL NT      00:33:52  MAY 07, 2009 CP=    223.955



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

 *** NOTE ***                            CP =     223.986   TIME= 00:33:52
 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).

 Set Output of XML File to:
     PARM,     ,     ,     ,     ,     ,     ,     ,     ,     ,     ,     ,
         ,     ,     ,     ,     ,     ,     ,

 DATABASE WRITTEN ON FILE
parm.xml



 PRINTOUT RESUMED BY /GOP

 EXIT THE ANSYS POST1 DATABASE PROCESSOR


 ***** ROUTINE COMPLETED *****  CP =       224.002



 PRINTOUT RESUMED BY /GOP

 *GET  _WALLDONE  FROM  ACTI  ITEM=TIME WALL  VALUE= 0.565000000

 PARAMETER _PREPTIME =     7.000000000

 PARAMETER _SOLVTIME =     237.0000000

 PARAMETER _POSTTIME =     3.000000000

 PARAMETER _TOTALTIM =     247.0000000

 EXIT ANSYS WITHOUT SAVING DATABASE


 NUMBER OF WARNING MESSAGES ENCOUNTERED=          3
 NUMBER OF ERROR   MESSAGES ENCOUNTERED=          0

 *** PAGE FILE USED  ***
 NUMBER OF R/W OPERATIONS=         7799
 MAXIMUM RECORD NUMBER   =         5279
 RECORD SIZE (I*4 WORDS) =        16384
 PAGE FILE SIZE (MB)     =      329.938


 *------------------------------------------------------------------------------*
 |                                                                              |
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|                          ANSYS RUN COMPLETED                                 |
|                                                                              |
|------------------------------------------------------------------------------|
|                                                                              |
|            Release 11.0           UP20070125         INTEL NT               |
|                                                                              |
|------------------------------------------------------------------------------|
|                                                                              |
|   Maximum Scratch Memory Used       =   117107140 Words      446.728 MB     |
|                                                                              |
|------------------------------------------------------------------------------|
|                                                                              |
|        CP Time      (sec) =        224.017       Time  =  00:33:54           |
|        Elapsed Time (sec) =        249.000       Date  =  05/07/2009         |
|                                                                              |
*------------------------------------------------------------------------------*
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