RAS M-276

Structural Integrity Associates, Inc.	File No.: VY-16Q-304
CALCULATION PACKAGE	**Project No.:** VY-16Q

PROJECT NAME:

Environmental Fatigue Analysis of VYNPS

CONTRACT NO.:

10150394

CLIENT:	**PLANT:**
Entergy Nuclear Operations, Inc	Vermont Yankee Nuclear Power Station

CALCULATION TITLE:

Recirculation Outlet Nozzle Finite Element Model

Document Revision	Affected Pages	Revision Description	Project Manager Approval Signature & Date	Preparer(s) & Checker(s) Signatures & Date
0	1-6, Appendix: A1-A20	Initial Issue	Terry J. Herrmann 7/12/2007	Minghao Qin 7/12/2007 Jennifer E. Smith 7/12/2007

U.S. NUCLEAR REGULATORY COMMISSION
In the Matter of Entergy Nuclear Vermont Yankee LLC
Docket No. 50-271 Official Exhibit No. E2-13-VY
OFFERED by: Applicant/Licensee Intervenor
NRC Staff Other
IDENTIFIED on 7/21/08 Witness/Panel NEC 2
Action Taken: ADMITTED REJECTED WITHDRAWN
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Table of Contents

1.0 OBJECTIVE 3
2.0 GEOMETRY / MATERIAL PROPERTIES 3
3.0 PROGRAM INPUT 3
4.0 REFERENCES 4
APPENDIX A RON_VY.INP A1

List of Tables

Table 1: Material Properties @ 300°F 5

List of Figures

Figure 1: ANSYS Finite Element Model 6

1.0 OBJECTIVE

The objective of this calculation is to create a finite element model of the Vermont Yankee Nuclear Power Station recirculation outlet nozzle. This model will be used to develop a Green's Function to be used in a subsequent fatigue analysis.

2.0 GEOMETRY / MATERIAL PROPERTIES

A 2-D axisymmetric finite element model (FEM) of the nozzle was developed with element type PLANE182. The developed model includes the safe end, the nozzle forging, a portion of the vessel shell, and cladding. The model used the vessel radius multiplied by a factor 2.0 due to the model being axisymmetric.

The 2-D axisymmetric FEM was constructed using the dimensions and information from References [4 and 5] based on ANSYS [2] finite element software. Figure 1 shows the resulting finite element model.

The materials of the various components of the model are listed below:

- Safe End – SA182 F316 [4] (16Cr-12Ni-2Mo)
- Piping – SA376 TP316 [7] (16Cr-12Ni-2Mo)
- Nozzle Forging – SA508 Class 2 [5] (3/4Ni-1/2Mo-1/3Cr-V)
- Vessel – SA533 Grade B [6] (Mn-1/2Mo-1.2Ni)
- Cladding – SA240 Type 304 [1, Sheet 7] (18Cr-8Ni)

Material properties for these materials are based upon the 1998 ASME Code, Section II, Part D, with 2000 Addenda [3] and are shown in Table 1. The properties are taken at an average temperature of 300°F. This average temperature is based on a thermal shock of 500°F to 100°F which will be applied to the FEM model for Green's Function development.

3.0 PROGRAM INPUT

The input file, RON_VY.INP (included in Appendix A), creates the finite element model for the recirculation outlet nozzle.

4.0 REFERENCES

1. GE. Stress Report No. 23A4316, Revision 0, "Reactor Vessel Recirculation Outlet Safe End," SI File No. VY-16Q-204.
2. ANSYS, Release 8.1 (w/Service Pack 1), ANSYS, Inc., June 2004.
3. American Society of Mechanical Engineers, Boiler and Pressure Vessel Code, Section II, Part D, 1998 Edition, 2000 Addenda.
4. Vermont Yankee Drawing 5920-06623, Rev. 0, (Hitachi, Ltd. Drawing No IOR290-127), "Recirc. Outlet Safe End," SI File No. VY-16Q-204.
5. Vermont Yankee Drawing 5920-00238, Rev. 4, (Chicago Bridge & Iron Company, Contract No. 9-6201, Drawing No. 21), "36"x28" Nozzles Mk N1A/B," SI File No. VY-16Q-204.
6. Vermont Yankee Drawing 5920-05752, Rev. 3, "Vessel & Attachments Material Identifications," SI File No. VY-16Q-209.
7. SI File No. VY-16Q-103, "Vermont Yankee Comments on VY-16Q-304."

Table 1: Material Properties @ 300°F (1)

Material	SA533 Grade B (Mn-1/2Mo-1/2Ni)	SA508 Class 2 (3/4Ni-1/2Mo-1/3Cr-V)	SA240 Type 304 (18Cr-8Ni)	SA182 F316/ SA376 TP316 (16Cr-12Ni-2Mo)
Modulus of Elasticity, e-6 psi	28.0	26.7	27.0	27.0
Coefficient of Thermal Expansion, e-6, in/in/°F	7.7	7.3	9.8	9.8
Thermal Conductivity, Btu/hr-ft-°F	23.4	23.4	9.8	9.3
Thermal Diffusivity, ft^2/hr	0.401	0.401	0.160	0.150
Specific Heat, Btu/lb-°F (2)	0.119	0.119	0.125	0.127
Density, lb/in^3	0.283	0.283	0.283	0.283
Poisson's Ratio	0.3	0.3	0.3	0.3

Notes:

1. The material properties applied in the analyses are taken from ASME Section II Part D 1998 Edition with 2000 Addenda. This is consistent with information provided in the Design Input Record (page 13 of VY EC No. 1773, SI File No. VY-16Q-209). The use of a later code edition than that used for the original design code is acceptable since later editions typically reflect more accurate material properties than was published in prior Code editions. Material Properties are evaluated at 300°F from the 1998 ASME Code, Section II, Part D, with 2000 Addenda, except for density and Poisson's ratio, which are assumed typical values.
2. Calculated as $[k/(\rho d)]/12^3$.

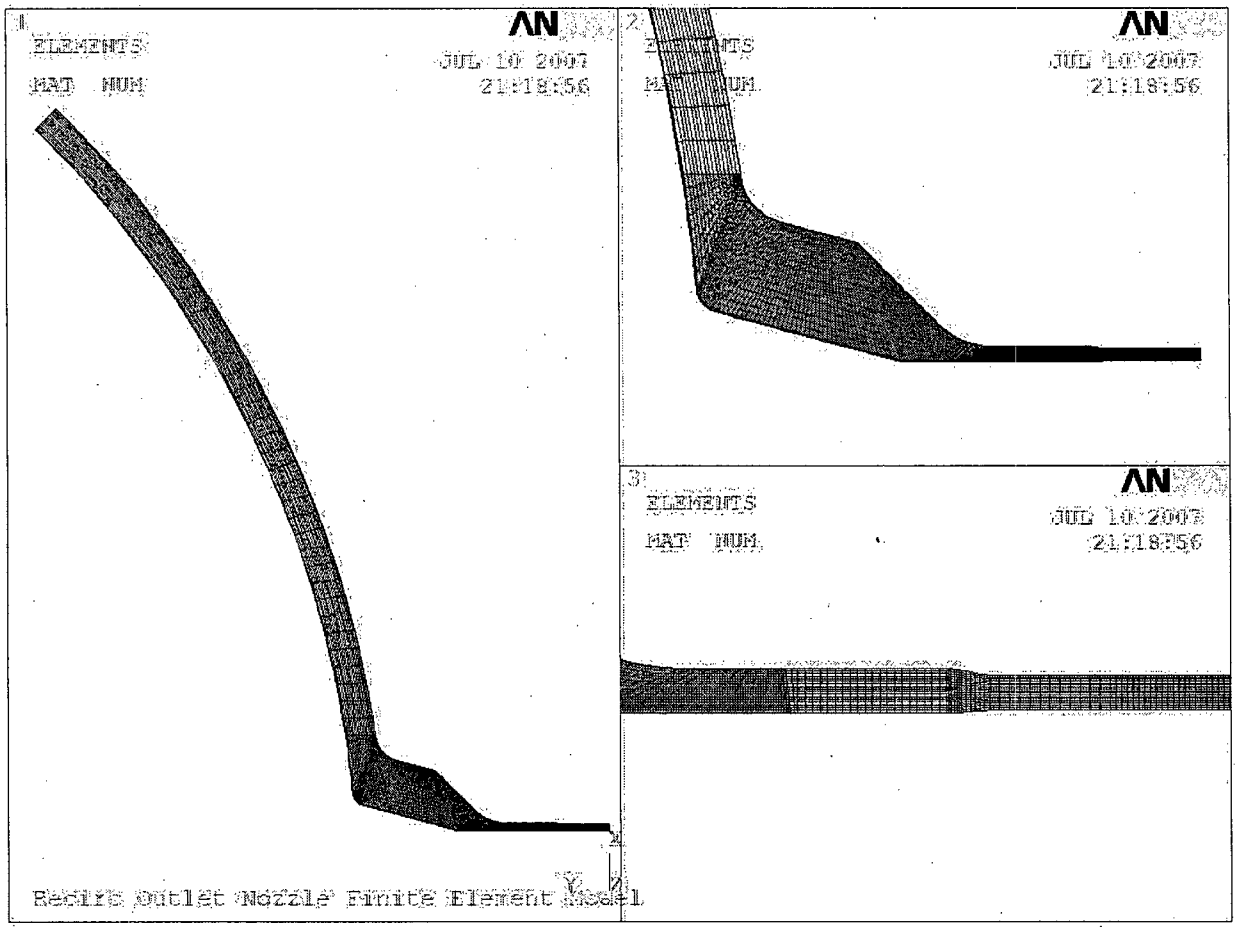

Figure 1: ANSYS Finite Element Model

APPENDIX A

RON_VY.inp

```
finish
/clear,start
/prep7
/title, Recirc Outlet Nozzle Finite Element Model

/com, PLANE182, 2-D Solid
et,1,PLANE182,,,1    !Axisymmetric

/com, ****************************
/com, Material Properties @T=300F
/com, ****************************

/COM, Material #1 (Safe-End and Piping)  SA-182 F316  (16Cr-12Ni-2Mo)
mp,ex,1,27E+06
mp,alpx,1,9.8E-06
mp,kxx,1,9.3/3600/12
mp,c,1,0.127
mp,nuxy,1,0.3
mp,dens,1,0.283

/COM, Material #2 (Nozzle Forging) SA-508 Class 2 (3/4Ni-1/2Mo-1/3Cr-V)
mp,ex,2,26.7E+06
mp,alpx,2,7.3E-06
mp,kxx,2,23.4/3600/12
mp,c,2,0.119
mp,nuxy,2,0.3
mp,dens,2,0.283

/COM, Material #3 (Cladding) SA-240 Type 304 (18Cr-8Ni)
mp,ex,3,27E+06
mp,alpx,3,9.8E-06
mp,kxx,3,9.8/3600/12
mp,c,3,0.125
mp,nuxy,3,0.3
mp,dens,3,0.283

/COM, Material #4 (Vessel) SA-533, GR. B (Mn-1/2Mo-1/2Ni)
mp,ex,4,28.0E+06
mp,alpx,4,7.7E-06
mp,kxx,4,23.4/3600/12
mp,c,4,0.119
mp,nuxy,4,0.3
mp,dens,4,0.283

*AFUN,DEG
/com, *** Geometric Parameters ***
*set,vira,(103+3/16)      !Actual Vessel Inner Radius to base metal used for model
*set,vir,2.0*vira         !2.0 time of  Vessel Inner Radius to base metal used for model
*set,tvw,5+5/8-3/16       !Vessel Wall Thickness
*set,ri1,25.75/2
*set,ro1,28.375/2
*set,L1,5
*set,ro2,28.375/2
```

```
*set,L2,4.25
*set,ro3,28.875/2
*set,ro4,48.75/2
*set,L3,1.5
*set,L4,5.25
*set,L5,7+1/16
*set,L6,12+13/16
*set,L7,9+7/8
*set,L8,9+3/8
*set,L9,31+15/16
*set,L10,L9-12-13/16-tvw
*set,ra,7
*set,rb,1
*set,rc,5.25
*set,rd,2.5
*set,tv,3/16
*set,dimA,vir-(tv*2.0)+L9+11+L1  !Vessel Centerline to End of Safe End used for model
*set,L21,1
*set,L22,4.25
*set,ri21,(25+15/16)/2

/com,*********************************************************************
/com, Geometry
/com,*********************************************************************
local,13,0,,dimA,,,,

csys,13

/com, Begin at end of Safe-End - Carbon Section

k, 1, ri1, -1*(dimA)
k, 2, ri1+tv, -1*(dimA)
k, 3, ro1, -1*(dimA)
k, 4, ri1, -1*(dimA-L1)
k, 5, ri1+tv, -1*(dimA-L1)
k, 6, ro1, -1*(dimA-L1)
k, 7, ri1, -1*(dimA-L1-L2)
k, 8, ri1+tv, -1*(dimA-L1-L2)
k, 9, ro2, -1*(dimA-L1-L2)
k, 10, ri1, -1*(dimA-L1-L2-L3)
k, 11, ri1+tv, -1*(dimA-L1-L2-L3)
k, 12, ro3, -1*(dimA-L1-L2-L3)
k, 13, ri1, -1*(dimA-L1-L2-L3-L4)
k, 14, ri1+tv, -1*(dimA-L1-L2-L3-L4)
k, 15, ro3, -1*(dimA-L1-L2-L3-L4)
k, 16, ri1, -1*(dimA-L1-L2-L3-L4-L5)
k, 17, ri1+tv, -1*(dimA-L1-L2-L3-L4-L5)
k, 18, ro3, -1*(dimA-L1-L2-L3-L4-L5)

k,19,    ro4, -1*(dimA-L1-L2-L3-L4-L5-L7)! Temporary Point
l,19,18
l,18,15
lfillt,1,2,ra
k,22,    ro4+(L8+6)*tan(15), -1*(dimA-L1-L2-L3-L4-L5-L7-(L8+6))
l,19,22
```

```
LFILLT,1,4,rb

k, 25, ri1, -1*(dimA-L1-L2-L3-L4-L6)
k, 26, ri1+tv, -1*(dimA-L1-L2-L3-L4-L6)

k, 27, ri1+(L10+tvw+tv+4)*tan(15), -1*(vir-tv-4)
k, 28, ri1+tv+(L10+tvw+tv+4)*tan(15), -1*(vir-tv-4)

k,29,    (vir+tvw+tv)*sin(45), -1*(vir+tvw+tv)*cos(45)
k,30,    0, -1*(vir+tvw+tv)   ! Temporary Point
k,31,    0, 0 ! Temporary Point

larc,29,30,31,vir+tvw+tv

k,32,    (vir+tv)*sin(45), -1*(vir+tv)*cos(45)
k,33,    0, -1*(vir+tv)   ! Temporary Point
larc,32,33,31,vir+tv

k,34,    vir*sin(45), -1*vir*cos(45)
k,35,    0, -1*vir   ! Temporary Point
larc,34,35,31,vir

LSTR,    4,    5
LSTR,    5,    6
LSTR,    6,    9
LSTR,    9,    12
LSTR,    12,   15
LSTR,    5,    8
LSTR,    4,    7
LSTR,    7,    10
LSTR,    8,    11
LSTR,    11,   14
LSTR,    10,   13
LSTR,    13,   16
LSTR,    14,   17
LSTR,    16,   25
LSTR,    17,   26
LSTR,    26,   28
LSTR,    25,   27
LSTR,    4,    1
LSTR,    1,    2
LSTR,    2,    3
LSTR,    3,    6
LSTR,    5,    2
LSTR,    7,    8
LSTR,    8,    9
LSTR,    12,   11
LSTR,    11,   10
LSTR,    13,   14
LSTR,    14,   15

FLST,2,2,4,ORDE,2
FITEM,2,4
FITEM,2,6
LPTN,P51X
```

```
FLST,2,2,4,ORDE,2
FITEM,2,8
FITEM,2,25
LPTN,P51X

FLST,2,2,4,ORDE,2
FITEM,2,7
FITEM,2,24
LPTN,P51X

FLST,2,6,4,ORDE,6
FITEM,2,6
FITEM,2,25
FITEM,2,37
FITEM,2,40
FITEM,2,42
FITEM,2,44
LDELE,P51X, , ,1

!*
LFILLT,4,41,rd, ,
!*
LFILLT,43,8,rd, ,
!*
LFILLT,39,38,rc, ,

FLST,2;3,4,ORDE,3
FITEM,2,1
FITEM,2,3
FITEM,2,5
LCOMB,P51X, ,0
LSTR,    16,    17
LSTR,    17,    21
LSTR,    25,    26
LSTR,    26,    24
LSTR,    22,    30
LSTR,    30,    35
LSTR,    27,    28
LSTR,    28,    33
LSTR,    29,    32
LSTR,    32,    34

k,39,    0, -1*(vir+tvw+tv)

!Create Areas
FLST,2,4,4
FITEM,2,27
FITEM,2,30
FITEM,2,26
FITEM,2,9
AL,P51X
FLST,2,4,4
FITEM,2,28
FITEM,2,29
```

```
FITEM,2,10
FITEM,2,30
AL,P51X
FLST,2,4,4
FITEM,2,11
FITEM,2,32
FITEM,2,10
FITEM,2,14
AL,P51X
FLST,2,4,4
FITEM,2,15
FITEM,2,14
FITEM,2,9
FITEM,2,31
AL,P51X
FLST,2,4,4
FITEM,2,32
FITEM,2,33
FITEM,2,12
FITEM,2,17
AL,P51X
FLST,2,4,4
FITEM,2,16
FITEM,2,17
FITEM,2,31
FITEM,2,34
AL,P51X
FLST,2,4,4
FITEM,2,36
FITEM,2,13
FITEM,2,33
FITEM,2,18
AL,P51X
FLST,2,4,4
FITEM,2,19
FITEM,2,18
FITEM,2,35
FITEM,2,34
AL,P51X
FLST,2,4,4
FITEM,2,2
FITEM,2,5
FITEM,2,36
FITEM,2,21
AL,P51X
FLST,2,4,4
FITEM,2,20
FITEM,2,21
FITEM,2,3
FITEM,2,35
AL,P51X
FLST,2,4,4
FITEM,2,1
FITEM,2,37
FITEM,2,23
```

```
FITEM,2,5
AL,P51X
FLST,2,4,4
FITEM,2,22
FITEM,2,23
FITEM,2,25
FITEM,2,3
AL,P51X
FLST,2,4,4
FITEM,2,38
FITEM,2,42
FITEM,2,37
FITEM,2,8
AL,P51X
FLST,2,4,4
FITEM,2,4
FITEM,2,8
FITEM,2,25
FITEM,2,40
AL,P51X
FLST,2,4,4
FITEM,2,24
FITEM,2,45
FITEM,2,7
FITEM,2,42
AL,P51X
FLST,2,4,4
FITEM,2,6
FITEM,2,7
FITEM,2,44
FITEM,2,40
AL,P51X
FLST,2,4,4
FITEM,2,41
FITEM,2,43
FITEM,2,47
FITEM,2,44
AL,P51X
FLST,2,4,4
FITEM,2,39
FITEM,2,46
FITEM,2,45
FITEM,2,43
AL,P51X

! define materials
FLST,5,8,5,ORDE,2
FITEM,5,1
FITEM,5,-8
CM,_Y,AREA
ASEL, , , ,P51X
CM,_Y1,AREA
CMSEL,S,_Y
!*
CMSEL,S,_Y1
```

```
AATT,     1, ,  1,     0,
CMSEL,S,_Y
CMDELE,_Y
CMDELE,_Y1
!*
FLST,5,5,5,ORDE,5
FITEM,5,9
FITEM,5,11
FITEM,5,13
FITEM,5,15
FITEM,5,18
CM,_Y,AREA
ASEL, , , ,P51X
CM,_Y1,AREA
CMSEL,S,_Y
!*
CMSEL,S,_Y1
AATT,     2, ,  1,     0,
CMSEL,S,_Y
CMDELE,_Y
CMDELE,_Y1
!*
FLST,5,5,5,ORDE,5
FITEM,5,10
FITEM,5,12
FITEM,5,14
FITEM,5,16
FITEM,5,-17
CM,_Y,AREA
ASEL, , , ,P51X
CM,_Y1,AREA
CMSEL,S,_Y
!*
CMSEL,S,_Y1
AATT,     3, ,  1,     0,
CMSEL,S,_Y
CMDELE,_Y
CMDELE,_Y1
!*

!/com, Map mesh areas
FLST,5,10,4,ORDE,10
FITEM,5,5
FITEM,5,10
FITEM,5,28
FITEM,5,32
FITEM,5,-33
FITEM,5,36
FITEM,5,-37
FITEM,5,42
FITEM,5,45
FITEM,5,-46
CM,_Y,LINE
LSEL, , , ,P51X
CM,_Y1,LINE
```

```
CMSEL,,_Y
!*
LESIZE,_Y1, , ,15, , , , ,1
!*
FLST,5,10,4,ORDE,10
FITEM,5,3
FITEM,5,9
FITEM,5,25
FITEM,5,27
FITEM,5,31
FITEM,5,34
FITEM,5,-35
FITEM,5,40
FITEM,5,44
FITEM,5,47
CM,_Y,LINE
LSEL, , , ,P51X
CM,_Y1,LINE
CMSEL,,_Y
!*
LESIZE,_Y1, , ,2, , , , ,1
!*
FLST,5,3,4,ORDE,3
FITEM,5,39
FITEM,5,41
FITEM,5,43
CM,_Y,LINE
LSEL, , , ,P51X
CM,_Y1,LINE
CMSEL,,_Y
!*
LESIZE,_Y1, , ,80, , , , ,1
!*
FLST,5,3,4,ORDE,3
FITEM,5,6
FITEM,5,-7
FITEM,5,24
CM,_Y,LINE
LSEL, , , ,P51X
CM,_Y1,LINE
CMSEL,,_Y
!*
LESIZE,_Y1, , ,20, , , , ,1
!*
FLST,5,3,4,ORDE,3
FITEM,5,4
FITEM,5,8
FITEM,5,38
CM,_Y,LINE
LSEL, , , ,P51X
CM,_Y1,LINE
CMSEL,,_Y
!*
LESIZE,_Y1, , ,40, , , , ,1
!*
```

```
FLST,5,3,4,ORDE,3
FITEM,5,1
FITEM,5,22
FITEM,5,-23
CM,_Y,LINE
LSEL, , , ,P51X
CM,_Y1,LINE
CMSEL,,_Y
!*
LESIZE,_Y1, , ,30, , , , ,1
!*
FLST,5,6,4,ORDE,6
FITEM,5,2
FITEM,5,20
FITEM,5,-21
FITEM,5,26
FITEM,5,29
FITEM,5,-30
CM,_Y,LINE
LSEL, , , ,P51X
CM,_Y1,LINE
CMSEL,,_Y
!*
LESIZE,_Y1, , ,40, , , , ,1
!*
FLST,5,9,4,ORDE,2
FITEM,5,11
FITEM,5,-19
CM,_Y,LINE
LSEL, , , ,P51X
CM,_Y1,LINE
CMSEL,,_Y
!*
LESIZE,_Y1, , ,20, , , , ,1
!*

! Meshing
FLST,5,18,5,ORDE,2
FITEM,5,1
FITEM,5,-18
CM,_Y,AREA
ASEL, , , ,P51X
CM,_Y1,AREA
CHKMSH,'AREA'
CMSEL,S,_Y
!*
MSHKEY,1
AMESH,_Y1
MSHKEY,0
!*
CMDELE,_Y
CMDELE,_Y1
CMDELE,_Y2
!*
```

```
!Modify the safe end ID
FLST,2,6,5,ORDE,2
FITEM,2,1
FITEM,2,-6
ACLEAR,P51X
FLST,2,6,5,ORDE,2
FITEM,2,1
FITEM,2,-6
ADELE,P51X
FLST,2,9,4,ORDE,7
FITEM,2,9
FITEM,2,14
FITEM,2,-17
FITEM,2,26
FITEM,2,-27
FITEM,2,30
FITEM,2,-31
LDELE,P51X, , ,1

FLST,2,3,4,ORDE,3
FITEM,2,10
FITEM,2,28
FITEM,2,32
LDELE,P51X, , ,1
FLST,3,2,3,ORDE,2
FITEM,3,3
FITEM,3,6
KGEN,2,P51X, , ,-ro2+ri21, , , ,0
FLST,3,1,3,ORDE,1
FITEM,3,2
KGEN,2,P51X, , , ,L22, , ,0
FLST,3,3,3,ORDE,3
FITEM,3,1
FITEM,3,-2
FITEM,3,4
KGEN,2,P51X, , ,tv, , , ,0
FLST,3,2,3,ORDE,2
FITEM,3,10
FITEM,3,-11
KGEN,2,P51X, , , ,-(L3-L21), , ,0
FLST,3,1,3,ORDE,1
FITEM,3,23
KGEN,2,P51X, , ,5, , , ,0
LSTR,     23,     40
FLST,2,2,4,ORDE,2
FITEM,2,9
FITEM,2,12
LPTN,P51X
LDELE,     16, , ,1
FLST,2,4,3
FITEM,2,11
FITEM,2,23
FITEM,2,41
FITEM,2,12
A,P51X
```

```
FLST,2,4,3
FITEM,2,23
FITEM,2,8
FITEM,2,9
FITEM,2,41
A,P51X
FLST,2,4,3
FITEM,2,8
FITEM,2,7
FITEM,2,6
FITEM,2,9
A,P51X
FLST,2,4,3
FITEM,2,7
FITEM,2,5
FITEM,2,3
FITEM,2,6
A,P51X
FLST,2,4,3
FITEM,2,10
FITEM,2,20
FITEM,2,23
FITEM,2,11
A,P51X
FLST,2,4,3
FITEM,2,20
FITEM,2,4
FITEM,2,8
FITEM,2,23
A,P51X
FLST,2,4,3
FITEM,2,4
FITEM,2,2
FITEM,2,7
FITEM,2,8
A,P51X
FLST,2,4,3
FITEM,2,2
FITEM,2,1
FITEM,2,5
FITEM,2,7
A,P51X
FLST,5,8,5,ORDE,4
FITEM,5,1
FITEM,5,-6
FITEM,5,19
FITEM,5,-20
CM,_Y,AREA
ASEL, , , ,P51X
CM,_Y1,AREA
CMSEL,S,_Y
!*
CMSEL,S,_Y1
AATT,     1, ,  1,     0,
CMSEL,S,_Y
```

```
CMDELE,_Y
CMDELE,_Y1
!*
FLST,5,4,4,ORDE,4
FITEM,5,15
FITEM,5,-16
FITEM,5,26
FITEM,5,28
CM,_Y,LINE
LSEL, , , ,P51X
CM,_Y1,LINE
CMSEL,,_Y
!*
LESIZE,_Y1, , ,15, , , , ,1
!*
FLST,5,4,4,ORDE,4
FITEM,5,31
FITEM,5,48
FITEM,5,50
FITEM,5,52
CM,_Y,LINE
LSEL, , , ,P51X
CM,_Y1,LINE
CMSEL,,_Y
!*
LESIZE,_Y1, , ,2, , , , ,1
!*
FLST,5,6,4,ORDE,6
FITEM,5,9
FITEM,5,-10
FITEM,5,12
FITEM,5,14
FITEM,5,30
FITEM,5,32
CM,_Y,LINE
LSEL, , , ,P51X
CM,_Y1,LINE
CMSEL,,_Y
!*
LESIZE,_Y1, , ,6, , , , ,1
!*
FLST,5,3,4,ORDE,3
FITEM,5,11
FITEM,5,17
FITEM,5,49
CM,_Y,LINE
LSEL, , , ,P51X
CM,_Y1,LINE
CMSEL,,_Y
!*
LESIZE,_Y1, , ,12, , , , ,1
!*
FLST,5,3,4,ORDE,3
FITEM,5,27
FITEM,5,29
```

```
FITEM,5,51
CM,_Y,LINE
LSEL, , , ,P51X
CM,_Y1,LINE
CMSEL,,_Y
!*
LESIZE,_Y1, , ,25, , , , ,1
!*
FLST,5,8,5,ORDE,4
FITEM,5,1
FITEM,5,-6
FITEM,5,19
FITEM,5,-20
CM,_Y,AREA
ASEL, , , ,P51X
CM,_Y1,AREA
CHKMSH,'AREA'
CMSEL,S,_Y
!*
MSHKEY,1
AMESH,_Y1
MSHKEY,0
!*
CMDELE,_Y
CMDELE,_Y1
CMDELE,_Y2
!*

FLST,2,2,5,ORDE,2
FITEM,2,17
FITEM,2,-18
ACLEAR,P51X

csys,0
k, 51,62/2,0,0
k, 52,62/2,60,0
LSTR,     51,     52
FLST,2,2,5,ORDE,2
FITEM,2,17
FITEM,2,-18
ADELE,P51X
lplo
FLST,2,4,4,ORDE,4
FITEM,2,39
FITEM,2,41
FITEM,2,43
FITEM,2,53
LPTN,P51X
FLST,2,2,4,ORDE,2
FITEM,2,60
FITEM,2,-61
LDELE,P51X, , ,1
FLST,2,4,4
FITEM,2,54
FITEM,2,62
```

```
FITEM,2,55
FITEM,2,44
AL,P51X
FLST,2,4,4
FITEM,2,55
FITEM,2,63
FITEM,2,58
FITEM,2,45
AL,P51X
FLST,2,4,4
FITEM,2,63
FITEM,2,56
FITEM,2,57
FITEM,2,46
AL,P51X
FLST,2,4,4
FITEM,2,47
FITEM,2,59
FITEM,2,57
FITEM,2,62
AL,P51X

CM,_Y,AREA
ASEL, , , ,    18
CM,_Y1,AREA
CMSEL,S,_Y
!*
CMSEL,S,_Y1
AATT,    2, ,  1,    0,
CMSEL,S,_Y
CMDELE,_Y
CMDELE,_Y1
!*
FLST,5,2,5,ORDE,2
FITEM,5,17
FITEM,5,22
CM,_Y,AREA
ASEL, , , ,P51X
CM,_Y1,AREA
CMSEL,S,_Y
!*
CMSEL,S,_Y1
AATT,    3, ,  1,    0,
CMSEL,S,_Y
CMDELE,_Y
CMDELE,_Y1
!*
CM,_Y,AREA
ASEL, , , ,    21
CM,_Y1,AREA
CMSEL,S,_Y
!*
CMSEL,S,_Y1
AATT,    4, ,  1,    0,
CMSEL,S,_Y
```

```
CMDELE,_Y
CMDELE,_Y1
!*
FLST,5,3,4,ORDE,3
FITEM,5,54
FITEM,5,-55
FITEM,5,58
CM,_Y,LINE
LSEL, , , ,P51X
CM,_Y1,LINE
CMSEL,,_Y
!*
LESIZE,_Y1, , ,8, , , , ,1
!*
FLST,5,3,4,ORDE,3
FITEM,5,56
FITEM,5,-57
FITEM,5,59
CM,_Y,LINE
LSEL, , , ,P51X
CM,_Y1,LINE
CMSEL,,_Y
!*
LESIZE,_Y1, , ,40, , , , ,1
!*
FLST,5,2,5,ORDE,2
FITEM,5,17
FITEM,5,-18
CM,_Y,AREA
ASEL, , , ,P51X
CM,_Y1,AREA
CHKMSH,'AREA'
CMSEL,S,_Y
!*
MSHKEY,1
AMESH,_Y1
MSHKEY,0
!*
CMDELE,_Y
CMDELE,_Y1
CMDELE,_Y2
!*
FLST,5,2,5,ORDE,2
FITEM,5,21
FITEM,5,-22
CM,_Y,AREA
ASEL, , , ,P51X
CM,_Y1,AREA
CHKMSH,'AREA'
CMSEL,S,_Y
!*
MSHKEY,1
AMESH,_Y1
MSHKEY,0
!*
```

```
CMDELE,_Y
CMDELE,_Y1
CMDELE,_Y2
!*

!Simulating Butter
FLST,2,2,5,ORDE,2
FITEM,2,9
FITEM,2,-10
ACLEAR,P51X
FLST,2,2,5,ORDE,2
FITEM,2,9
FITEM,2,-10
ADELE,P51X

KGEN,2,15, , , ,11/16, , ,0
KGEN,2,44, , , ,-0.25, , ,0
KGEN,2,14, , , ,11/16-1.375*tan(7.5), , ,0
KGEN,2,46, , , ,-0.25, , ,0

FLST,2,3,4,ORDE,3
FITEM,2,2
FITEM,2,20
FITEM,2,-21
LDELE,P51X
LSTR,    21,    44
LSTR,    44,    45
LSTR,    45,    15
LSTR,    17,    46
LSTR,    46,    47
LSTR,    47,    14
LSTR,    46,    44
LSTR,    45,    47
LSTR,    13,    16
FLST,3,2,3,ORDE,2
FITEM,3,46
FITEM,3,-47
KGEN,2,P51X, , ,-0.25, , , ,0
LSTR,    48,    46
LSTR,    49,    47
FLST,2,3,4,ORDE,3
FITEM,2,61
FITEM,2,64
FITEM,2,-65
LPTN,P51X
FLST,2,2,4,ORDE,2
FITEM,2,70
FITEM,2,-71
LDELE,P51X, , ,1
FLST,2,4,4
FITEM,2,67
FITEM,2,39
FITEM,2,68
FITEM,2,3
AL,P51X
```

```
FLST,2,4,4
FITEM,2,39
FITEM,2,5
FITEM,2,2
FITEM,2,53
AL,P51X
FLST,2,4,4
FITEM,2,20
FITEM,2,60
FITEM,2,53
FITEM,2,41
AL,P51X
FLST,2,4,4
FITEM,2,72
FITEM,2,68
FITEM,2,69
FITEM,2,41
AL,P51X
FLST,2,4,4
FITEM,2,21
FITEM,2,60
FITEM,2,36
FITEM,2,43
AL,P51X
FLST,2,4,4
FITEM,2,66
FITEM,2,69
FITEM,2,35
FITEM,2,43
AL,P51X

CM,_Y,AREA
ASEL, , , ,     10
CM,_Y1,AREA
CMSEL,S,_Y
!*
CMSEL,S,_Y1
AATT,     2, ,  1,     0,
CMSEL,S,_Y
CMDELE,_Y
CMDELE,_Y1
!*
FLST,5,3,5,ORDE,3
FITEM,5,9
FITEM,5,23
FITEM,5,-24
CM,_Y,AREA
ASEL, , , ,P51X
CM,_Y1,AREA
CMSEL,S,_Y
!*
CMSEL,S,_Y1
AATT,     3, ,  1,     0,
CMSEL,S,_Y
CMDELE,_Y
```

```
CMDELE,_Y1
!*
FLST,5,2,5,ORDE,2
FITEM,5,25
FITEM,5,-26
CM,_Y,AREA
ASEL, , , ,P51X
CM,_Y1,AREA
CMSEL,S,_Y
!*
CMSEL,S,_Y1
AATT,     1, ,   1,     0,
CMSEL,S,_Y
CMDELE,_Y
CMDELE,_Y1
!*
FLST,5,3,4,ORDE,3
FITEM,5,2
FITEM,5,39
FITEM,5,67
CM,_Y,LINE
LSEL, , , ,P51X
CM,_Y1,LINE
CMSEL,,_Y
!*
LESIZE,_Y1, , ,10, , , , ,1
!*
FLST,5,6,4,ORDE,6
FITEM,5,20
FITEM,5,-21
FITEM,5,41
FITEM,5,43
FITEM,5,66
FITEM,5,72
CM,_Y,LINE
LSEL, , , ,P51X
CM,_Y1,LINE
CMSEL,,_Y
!*
LESIZE,_Y1, , ,2, , , , ,1
!*
FLST,5,2,5,ORDE,2
FITEM,5,9
FITEM,5,-10
CM,_Y,AREA
ASEL, , , ,P51X
CM,_Y1,AREA
CHKMSH,'AREA'
CMSEL,S,_Y
!*
MSHKEY,1
AMESH,_Y1
MSHKEY,0
!*
CMDELE,_Y
```

```
CMDELE,_Y1
CMDELE,_Y2
!*
FLST,5,4,5,ORDE,2
FITEM,5,23
FITEM,5,-26
CM,_Y,AREA
ASEL, , , ,P51X
CM,_Y1,AREA
CHKMSH,'AREA'
CMSEL,S,_Y
!*
MSHKEY,1
AMESH,_Y1
MSHKEY,0
!*
CMDELE,_Y
CMDELE,_Y1
CMDELE,_Y2
!*

save
finish
```