

PRESSURE EQUIPMENT ENGINEERING SERVICES, INC.

402 WILD PEACH PLACE
MISSOURI CITY, TX - 77459

TEL. : (281)-261-4628

FAX : (281)-261-4629

E-Mail: Bharat@peesi.com

AXISYMMETRIC FINITE ELEMENTS ANALYSIS OF SKIRT-TO-VESSEL JUNCTURE

PROBLEM DESCRIPTION:

It was required to calculate the stresses in the skirt at the juncture of skirt to the vessel for compliance with ASME B&PV Code Section VIII, Div.-2. The client requested to perform an axisymmetric FEA of the Skirt-to-vessel juncture.

FEA MODEL & RESULTS:

The axisymmetric FEA model of the skirt, cylindrical shell ring # 1 and hemispherical head was generated using FEA software ANSYS. The pressure loading of 1409 psig was applied inside the shell and head. To simulate the longitudinal stress in the vessel shell, a calculated pressure load was applied at the top of the model. The appropriate modulus of elasticity was applied to compensate for the design temperature in the model. Three load cases were analyzed, involving "Pressure loading", "Weight + Wind loading" and "Pressure + Weight + Wind loading". The wind loading was applied as unidirectional vertical load to comply with the requirements of the axisymmetric model.

For all the loading combinations analyzed, the stress analysis results for the skirt were checked against the ASME code, Section VIII, Div.-2, Appendix-4 criteria. Based on the results of finite Element Analysis, all the stresses in the skirt were within the Code allowable stress limits for the current design of the skirt. The displacement of the top of the skirt was also small and acceptable.

Based on the results of the axisymmetric finite element analysis, the current design of the skirt was certified to be in code compliance with ASME B&PV Code, Section VIII, Div.-2.

The attached FEA plots show the model and results for one of the load cases analyzed for the skirt.

STEP=1

SUB =1

TIME=1

SINT (AVG)

PowerGraphics

EFACET=1

AVRES=Mat

DMX =.036859

SMN =2072

SMX =57216











ZV =1

*DIST=.687162

*XF =48.784

*YF =-8.676

Z-BUFFER

	2072
	8199
	14327
	20454
	26581
	32708
	38835
	44962
	51089
	57216




1

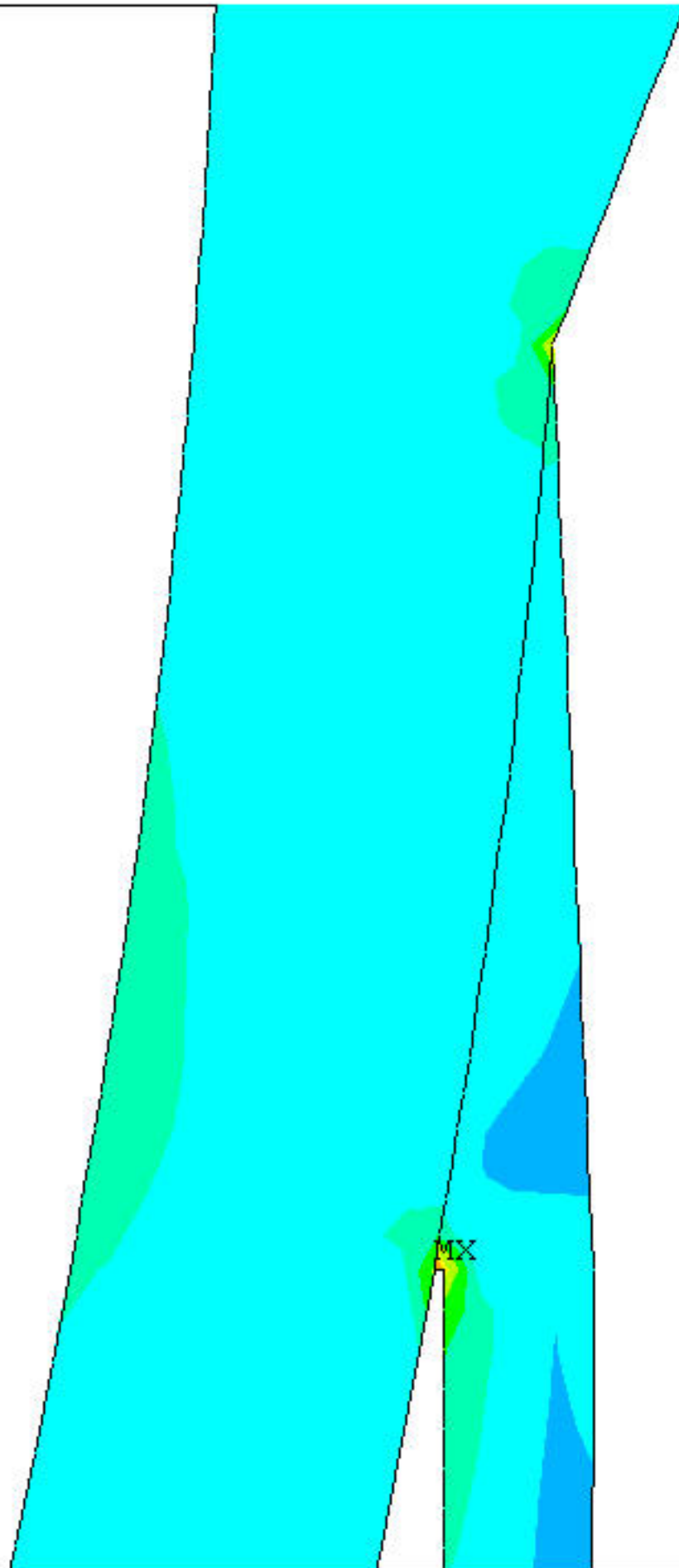


NODAL SOLUTION
STEP=1
SUB =1
TIME=1
SINT (AVG)
PowerGraphics
EFACET=1
AVRES=Mat
DMX =.036859
SMN =2072
SMX =57216

ZV =1
*DIST=3.951
*XF =48.525
*YF =-6.196

Z-BUFFER

	2072
	8199
	14327
	20454
	26581
	32708
	38835
	44962
	51089
	57216



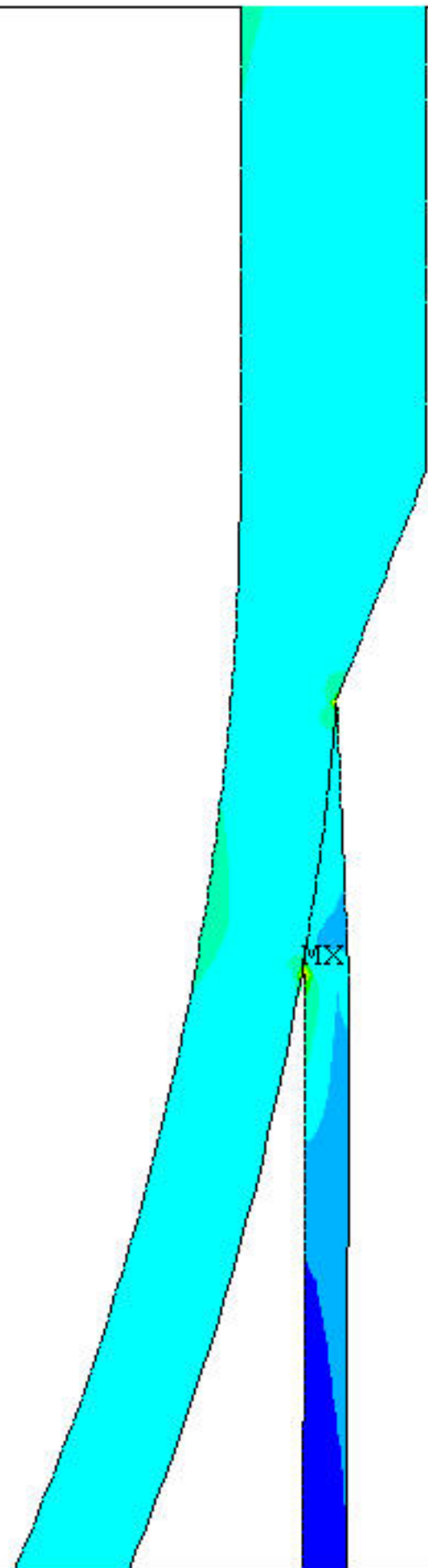
1



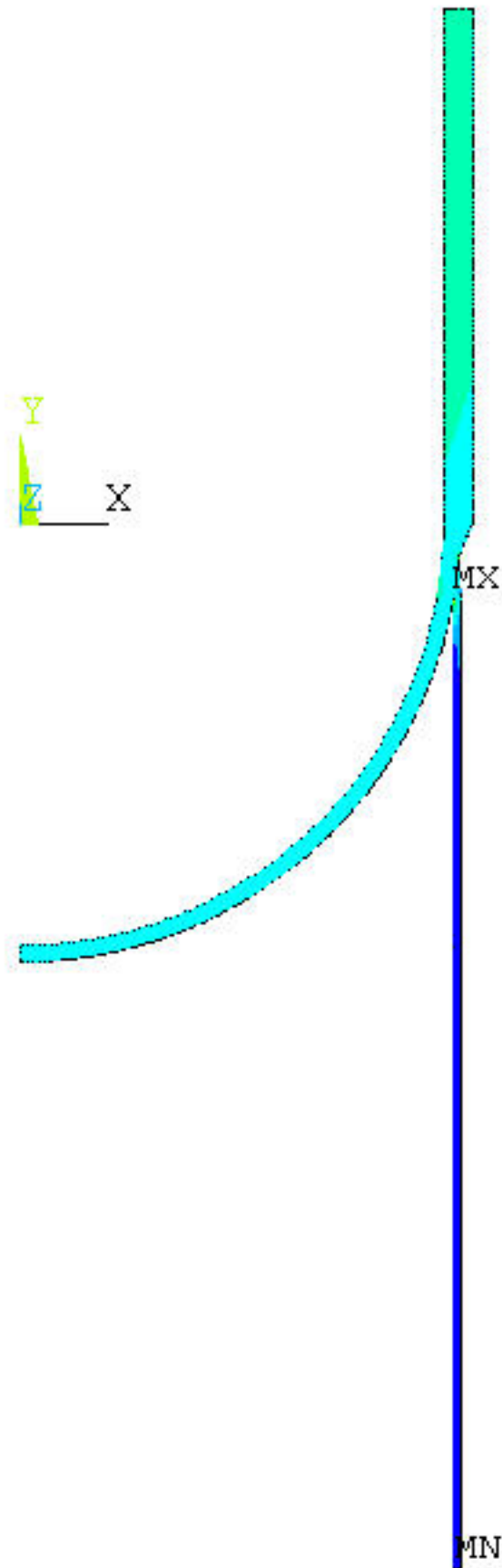
NODAL SOLUTION
STEP=1
SUB =1
TIME=1
SINT (AVG)
PowerGraphics
EFACET=1
AVRES=Mat
DMX =.036859
SMN =2072
SMX =57216

ZV =1
*DIST=13.397
*XF =48.484
*YF =-5.459

Z-BUFFER



1



NODAL SOLUTION
STEP=1
SUB =1
TIME=1
SINT (AVG)
PowerGraphics
EFACET=1
AVRES=Mat
DMX =.036859
SMN =2072
SMX =57216

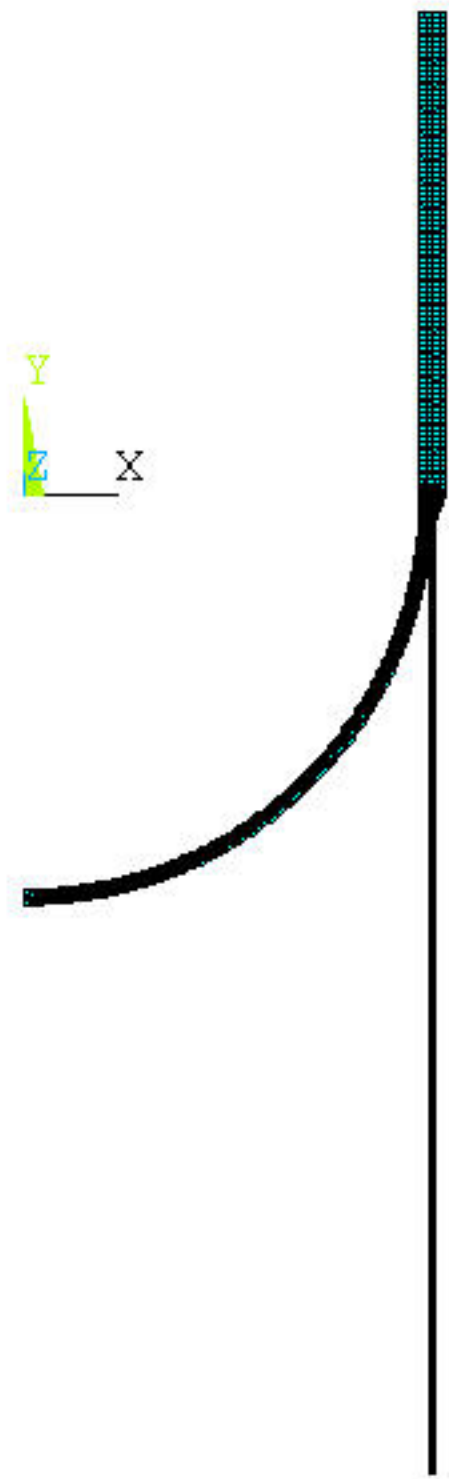
ZV =1
DIST=96.861
XF =25.487
YF =-30.065

Z-BUFFER

Blue	2072
Light Blue	8199
Cyan	14327
Light Cyan	20454
Green	26581
Light Green	32708
Yellow-Green	38835
Yellow	44962
Orange	51089
Red	57216

1

ANSYS



DISPLACEMENT
STEP=1
SUB =1
TIME=1
PowerGraphics
EFACET=1
AVRES=Mat
DMX =.036859











*DSCA=1
ZV =1
*DIST=114.015
*XF =24.943
*YF =-26.685
Z-BUFFER

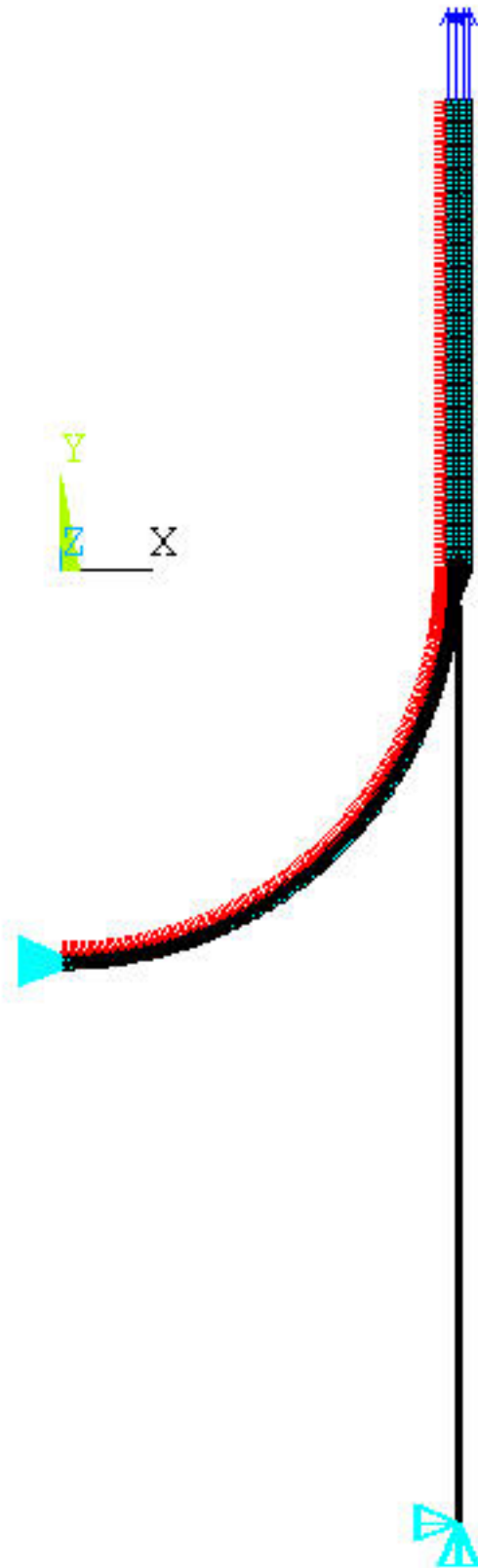
ELEMENTS
PowerGraphics
EFACET=1
MAT NUM
U

ZV =1
*DIST=114.015
*XF =24.943
*YF =-26.685

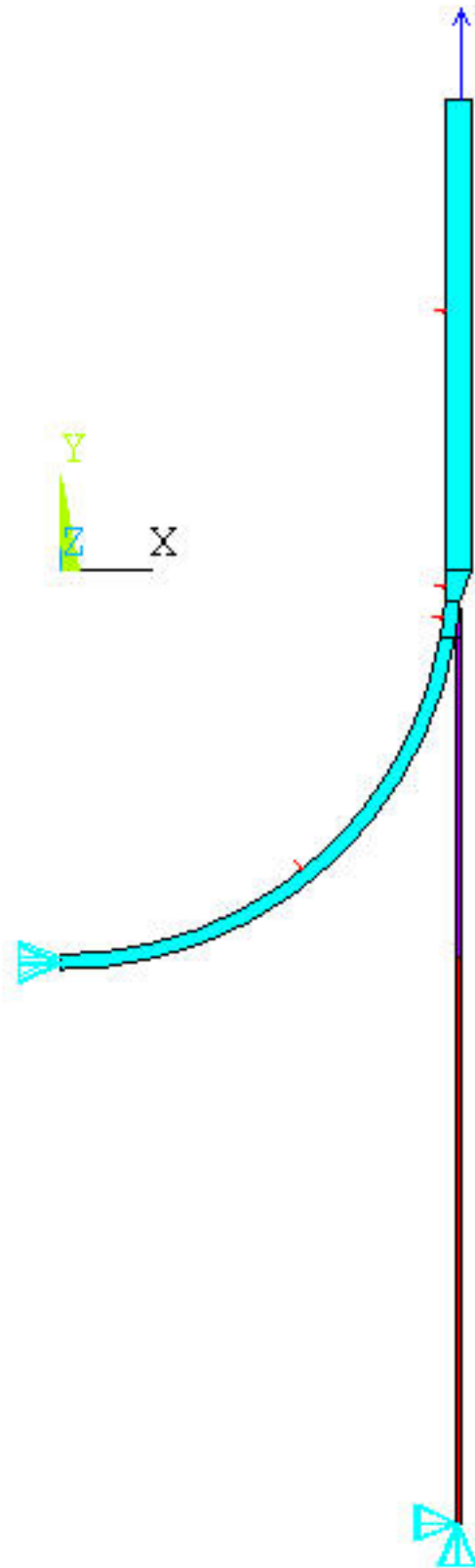
Z-BUFFER

PRES-NORM

	-9119
	-7949
	-6779
	-5610
	-4440
	-3270
	-2100
	-930.167
	239.667
	1409



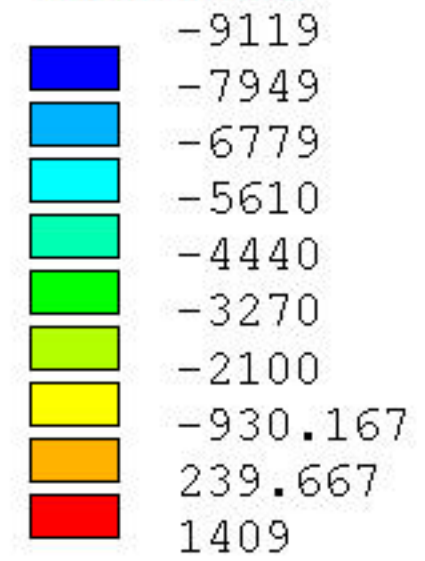
AREAS
PowerGraphics
MAT NUM
U



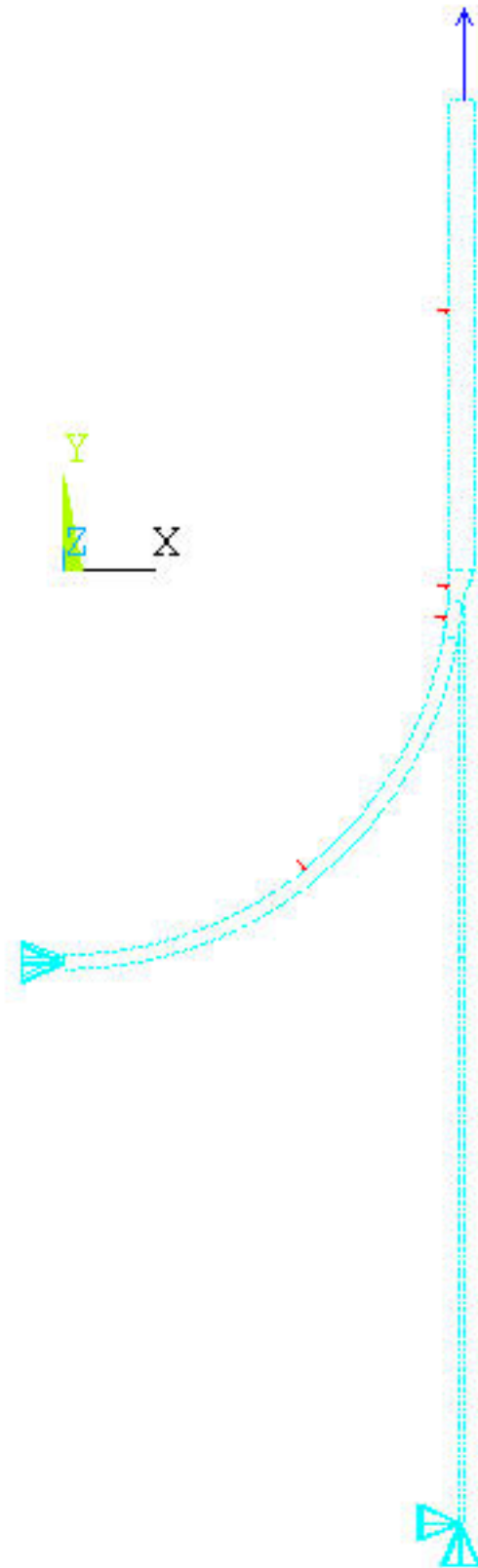
ZV =1
*DIST=114.015
*XF =24.943
*YF =-26.685

Z-BUFFER

PRES-NORM



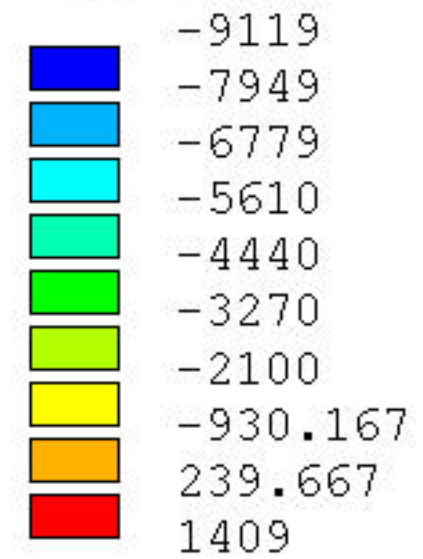
LINES
PowerGraphics
MAT NUM
U



ZV =1
*DIST=114.015
*XF =24.943
*YF =-26.685

Z-BUFFER

PRES-NORM

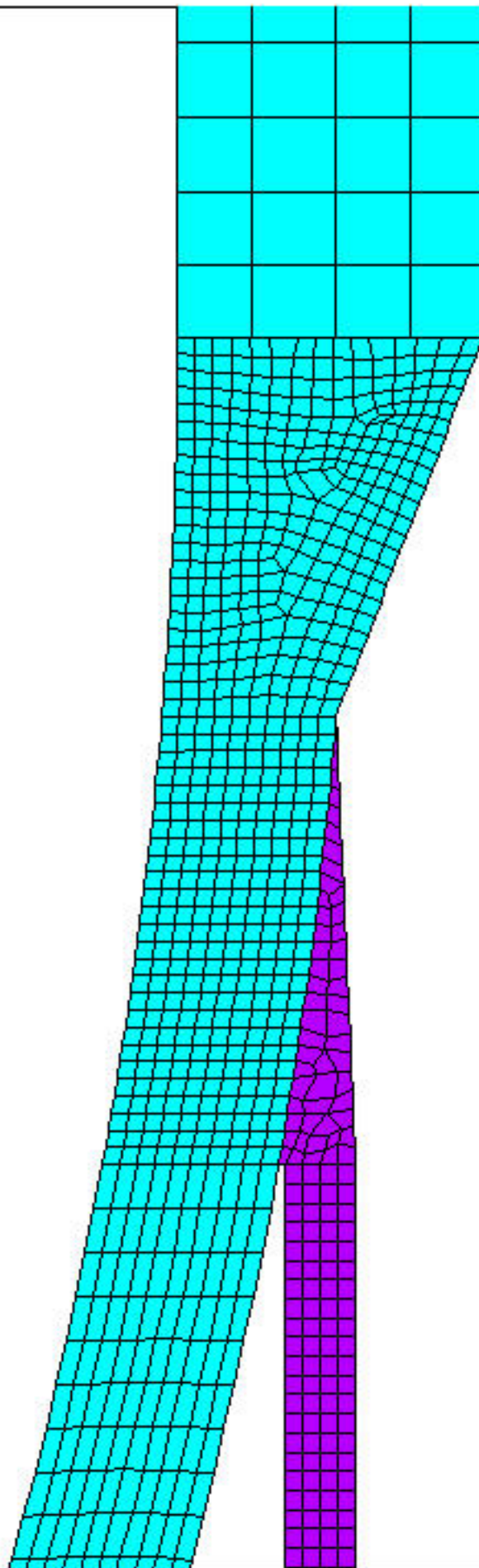


1



ELEMENTS
PowerGraphics
EFACET=1
MAT NUM

ZV =1
*DIST=8.15
*XF =49.11
*YF =-4.694
Z-BUFFER

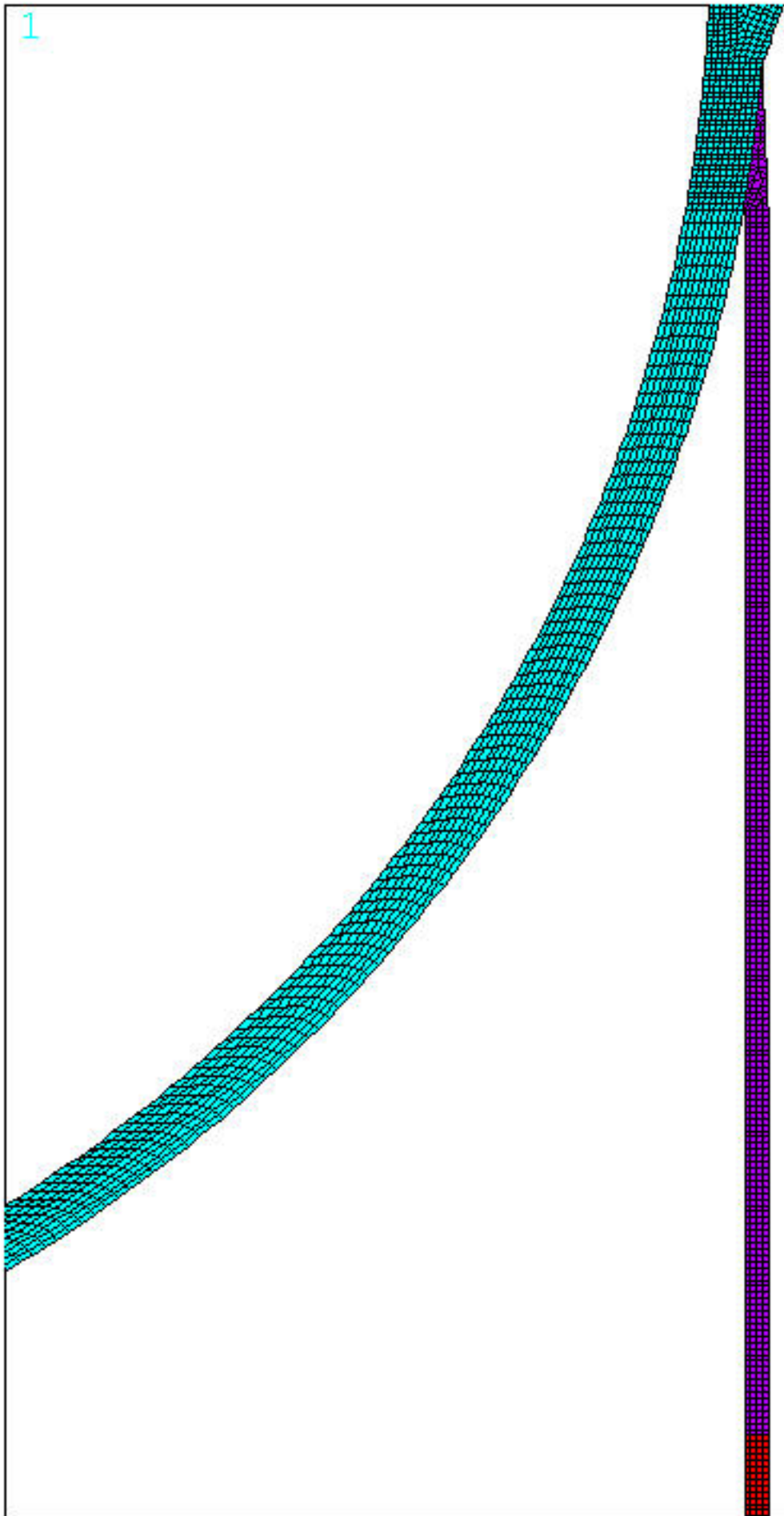


1



ELEMENTS
PowerGraphics
EFACET=1
MAT NUM

ZV =1
*DIST=24.274
*XF =49.39
*YF =-26.351
Z-BUFFER

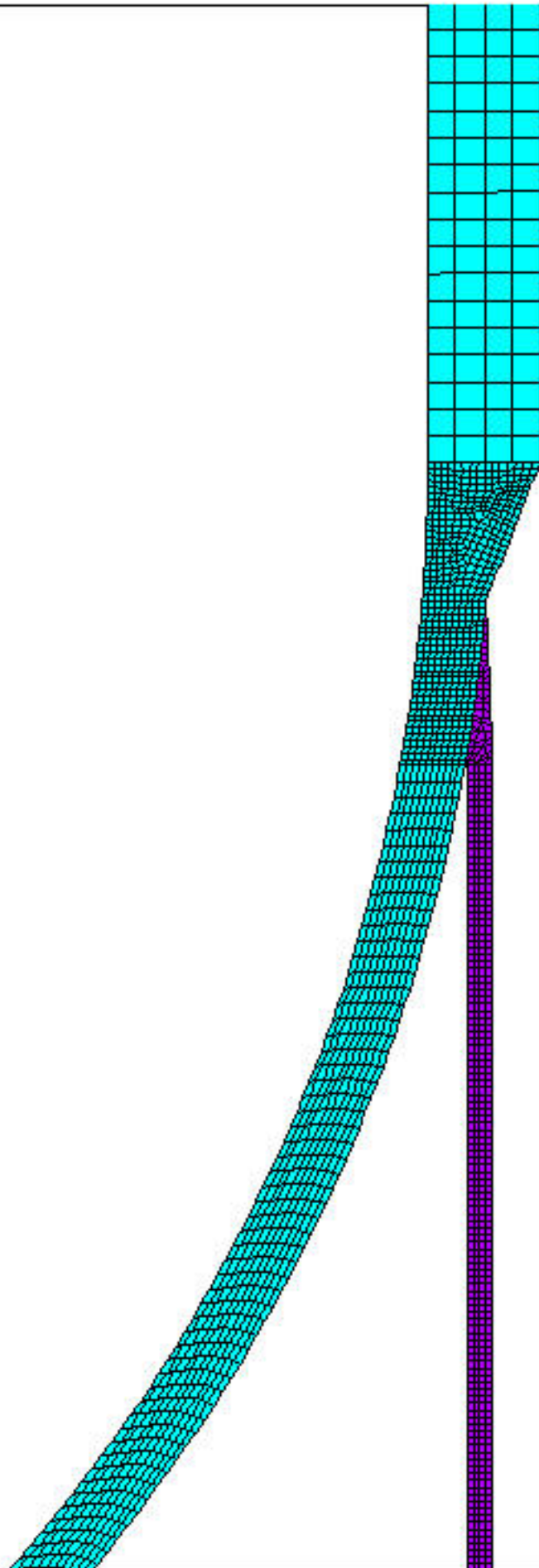


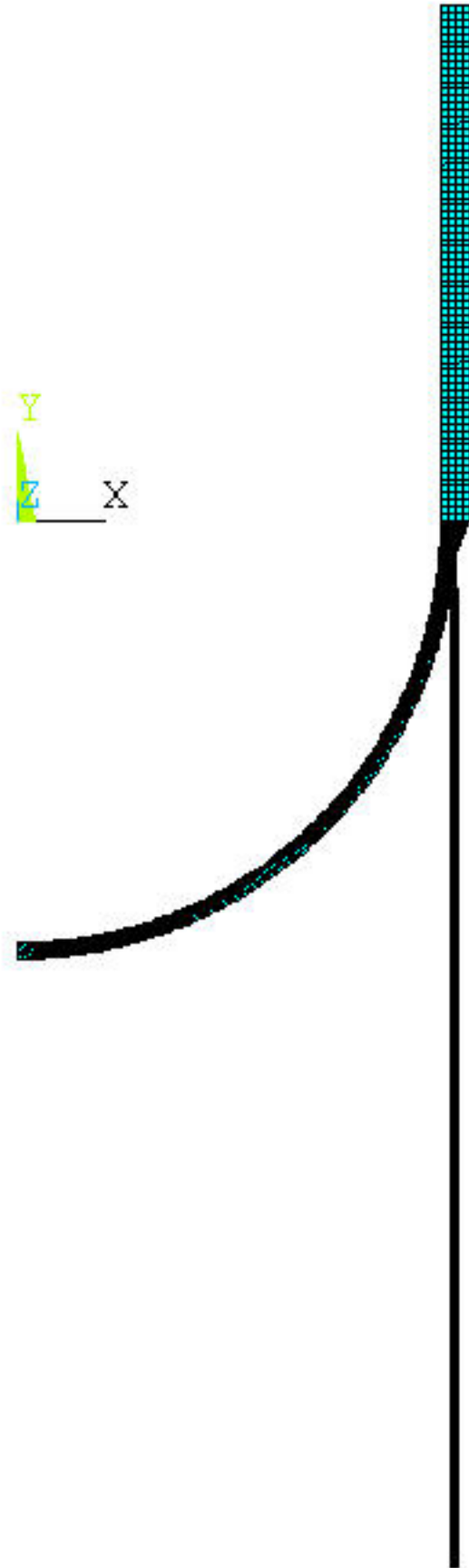
1



ELEMENTS
PowerGraphics
EFACET=1
MAT NUM

ZV =1
*DIST=22.296
*XF =45.39
*YF =-9.257
Z-BUFFER

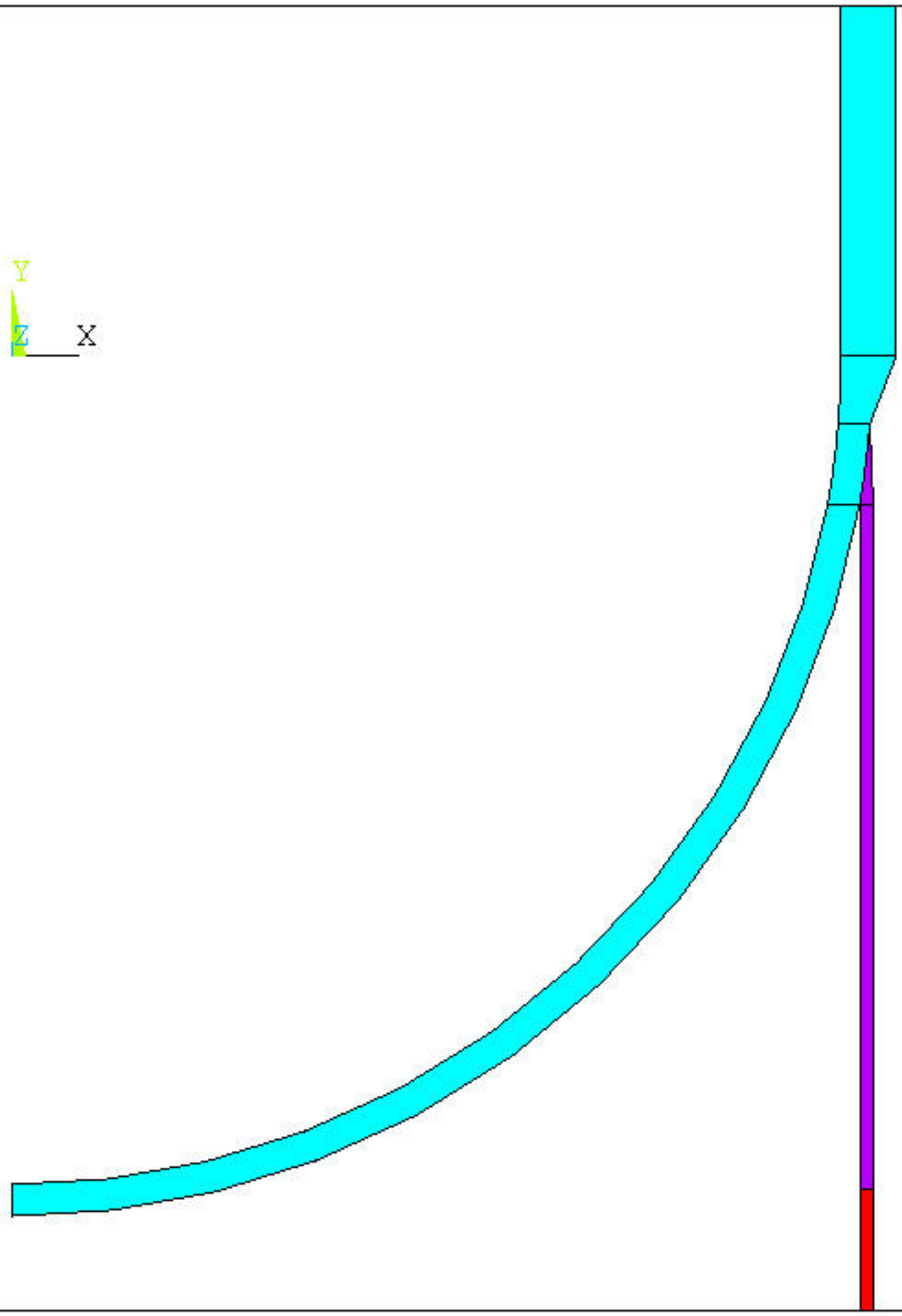




ELEMENTS
PowerGraphics
EFACET=1
MAT NUM

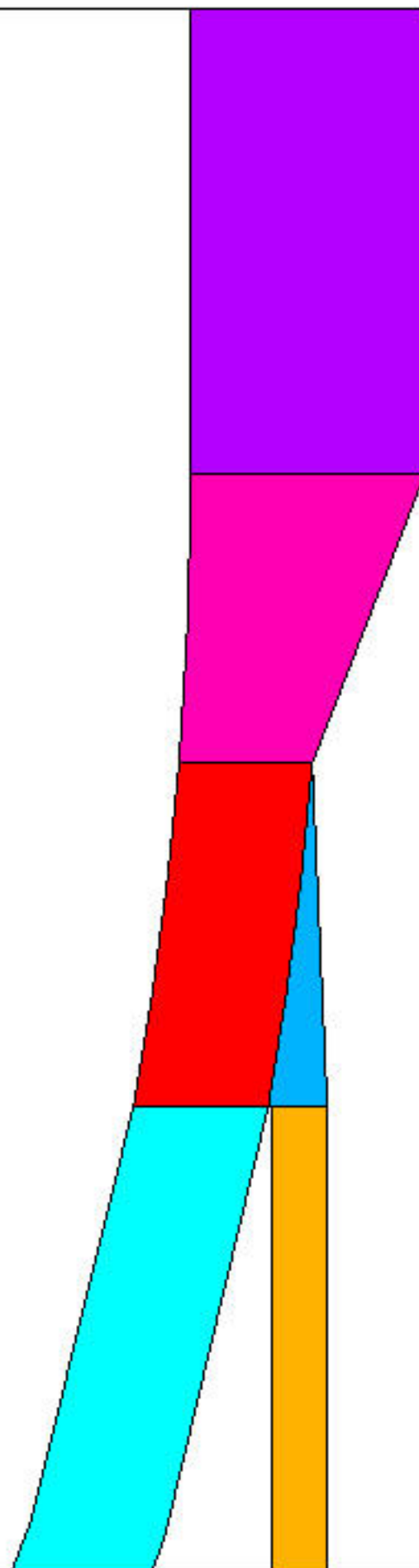
ZV =1
DIST=96.866
XF =25.471
YF =-30.06
Z-BUFFER

1
AREAS
MAT NUM



AREAS

AREA NUM



1

AREAS

AREA NUM

