

# Plane Stress Analysis of a Rib

By John Q. Analyst

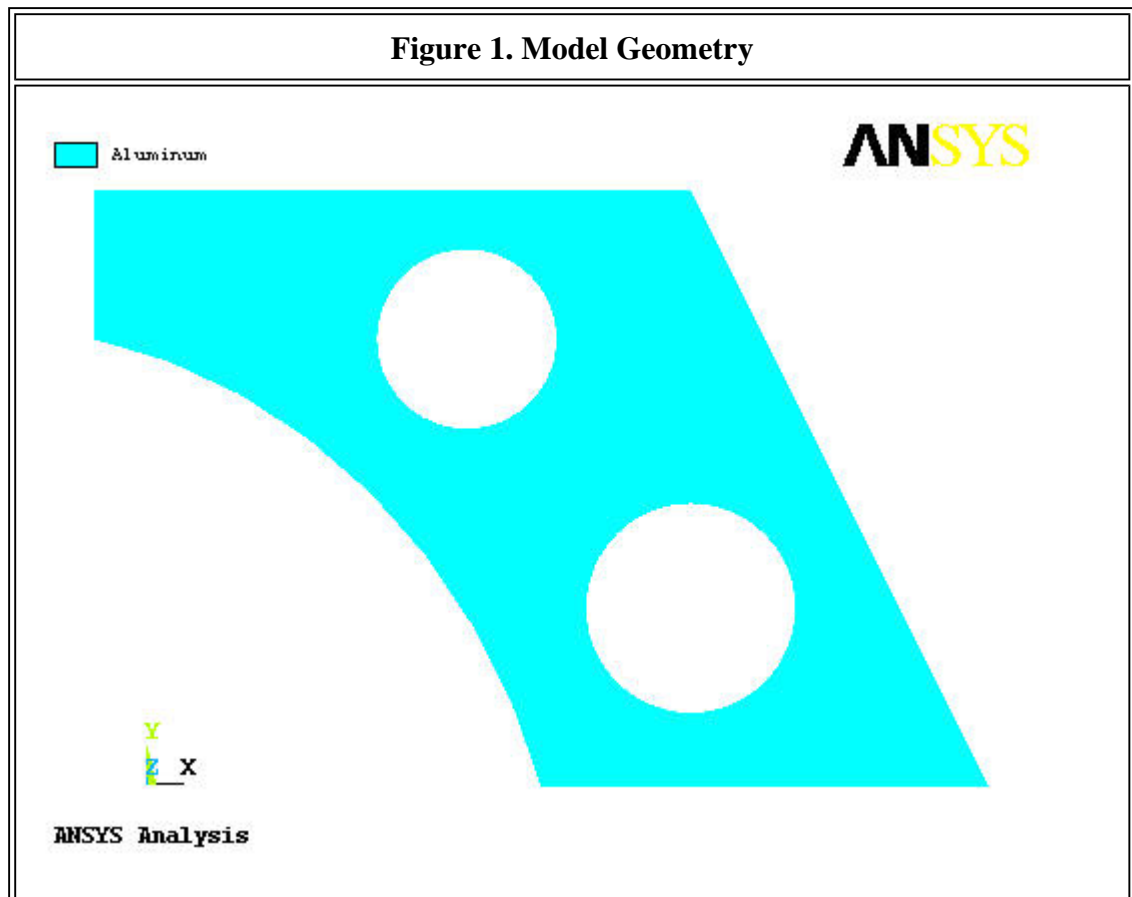
November 25, 1999

## An ANSYS Analysis

Report Generated by ANSYS Mechanical Toolbar

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## Summary

This report documents a linear static analysis of the part *ribgeom* which was imported from the file *G:/56-intro1/ansfiles/ribgeom.db* and subjected to the load environment *Environment 1*. The analysis was performed using the ANSYS 5.6 CAE software.

The part *ribgeom* was assigned properties of the material [Aluminum](#) and showed the following results:

**Maximum total displacement= 3.04658E-04 in**  
**Maximum equivalent stress= 2499.9 psi**

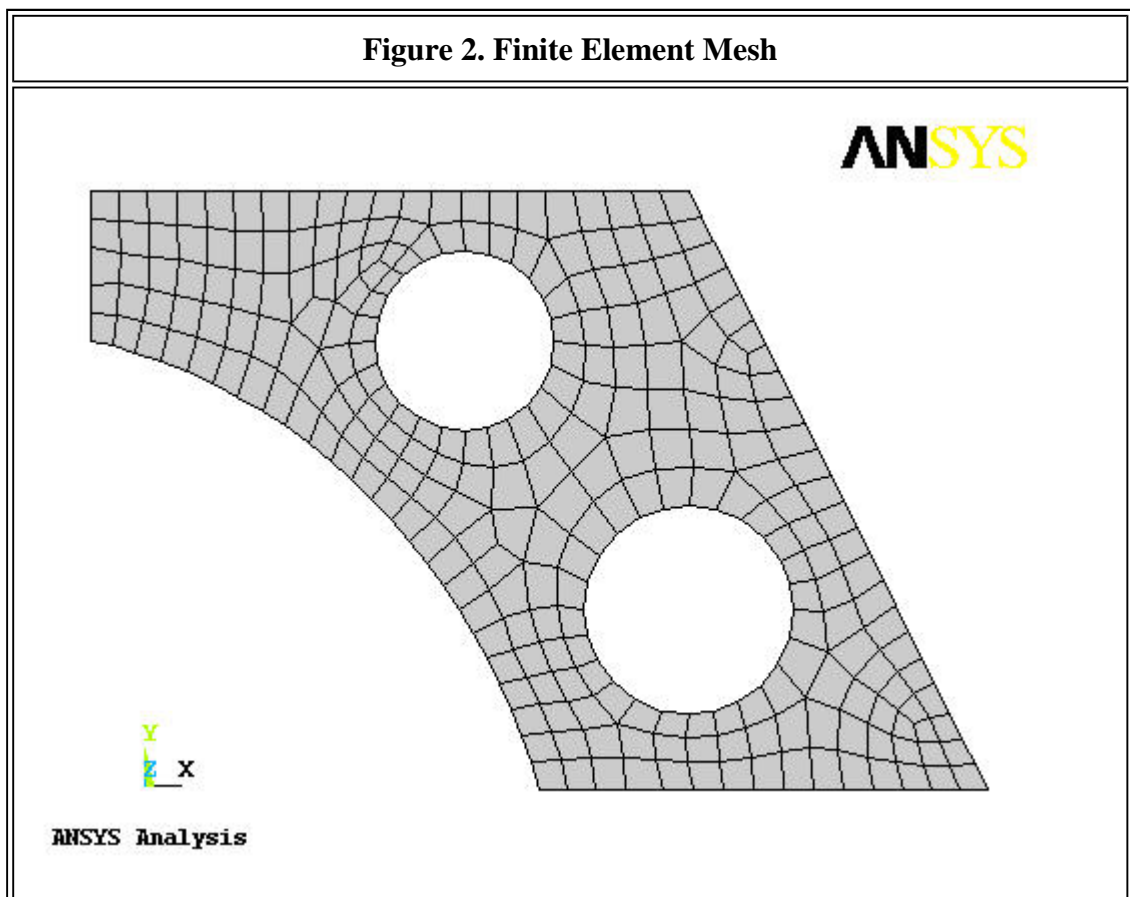
For details about the analysis, see [Model Information](#), [Analysis Information](#), and [Results Information](#).

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## Model Information

The part *ribgeom* has a weight of 3.4909E-02 lb ( 9.0344E-05 lbm ) and was imported from G:/56-intro1/ansfiles/ribgeom.db . [Figure 1](#) shows the model geometry and [Figure 2](#) shows the finite element mesh. [Table 1](#) lists the number of nodes and elements and [Table 2](#) lists the properties of the material (Aluminum ) used in the model.



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**Table 1. Details of the Finite Element Model**

Entity	Number Defined
PLANE82	253
Nodes	894

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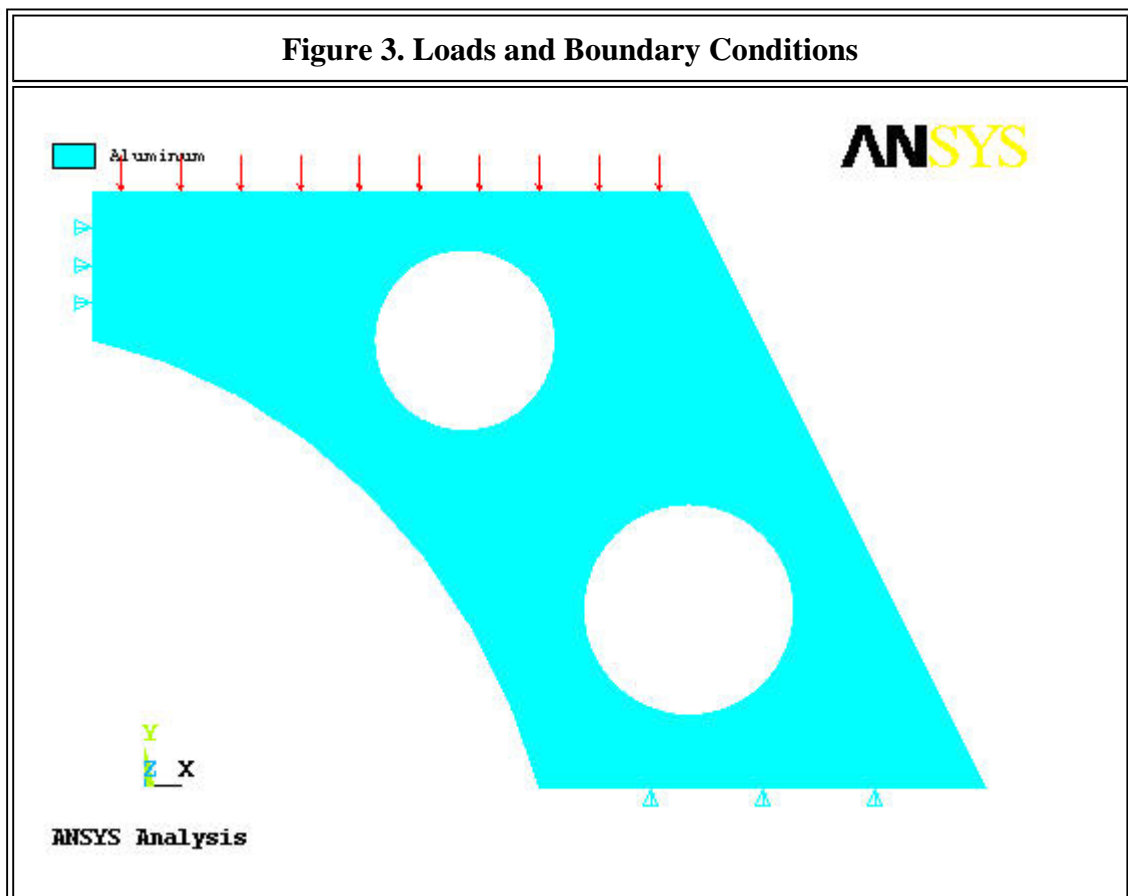
**Table 2. Material Properties**

Material Properties for Aluminum	
Modulus of Elasticity [ psi ]	1.0588E+07
Density [ lbm/in <sup>3</sup> ]	2.5923E-04
Poisson's Ratio	0.3300
Thermal Expansion Coefficient [ 1/degF ]	1.2611E-05

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## Analysis Information

The part *ribgeom* was subjected to the load environment *Environment 1* (see [Figure 3](#) and [Table 3](#)) and evaluated with a linear static analysis.



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**Table 3. Boundary Conditions for Environment: Environment 1**

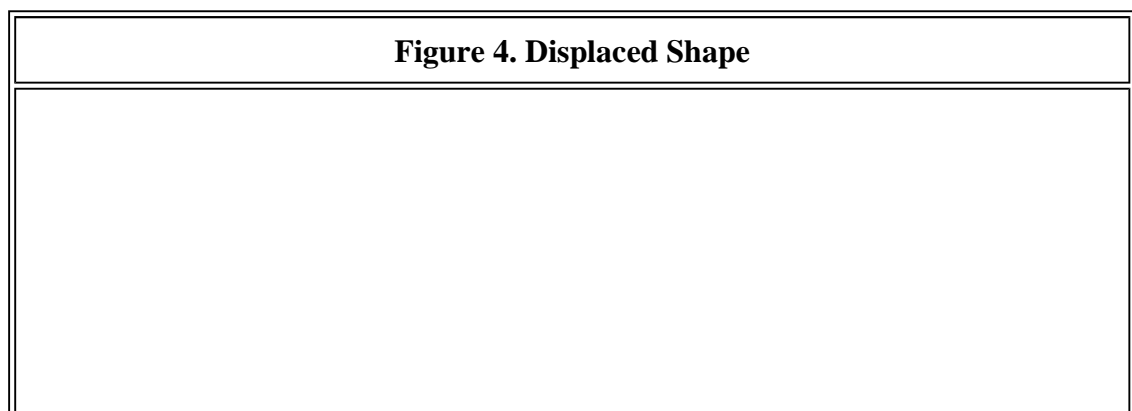
<b>Constraints</b>			
<b>Type</b>	<b>Entity</b>	<b>Direction</b>	<b>Coordinate System</b>
<b>Constrained Translation</b>	Line 2	Y	Global Cartesian
<b>Constrained Translation</b>	Line 5	X	Global Cartesian

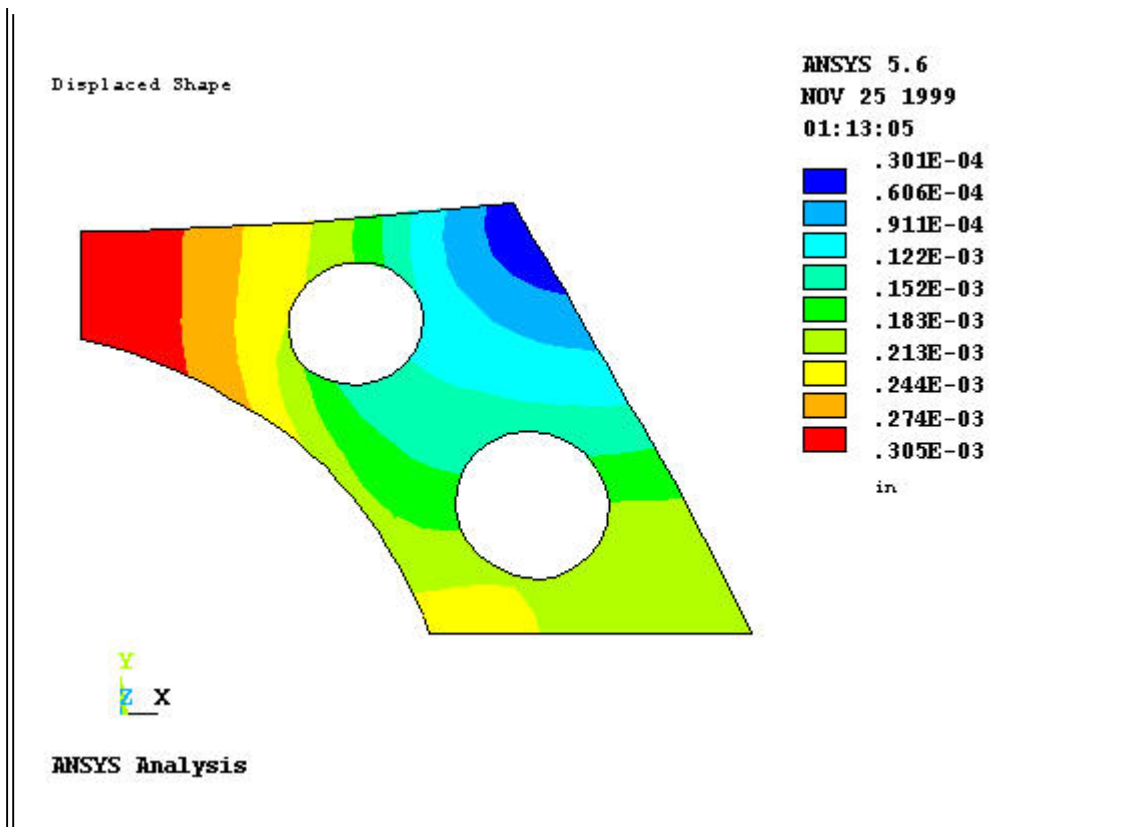
<b>Loads</b>					
		<b>Values (Global Cartesian Directions)</b>			
<b>Type</b>	<b>Entity</b>	<b>X</b>	<b>Y</b>	<b>Z</b>	<b>Applied to Entities</b>
<b>Pressure [ psi ]</b>	Line	100.0			4
<b>Gravity [ in/s<sup>2</sup> ]</b>	Volume	0.000	0.000	0.000	All
<b>Angular Velocity [ RPM ]</b>	Volume	0.000	0.000	0.000	All
<b>Uniform Temperature [ degF ]</b>	Volume	0.000	(Tref= 0.000 )		All

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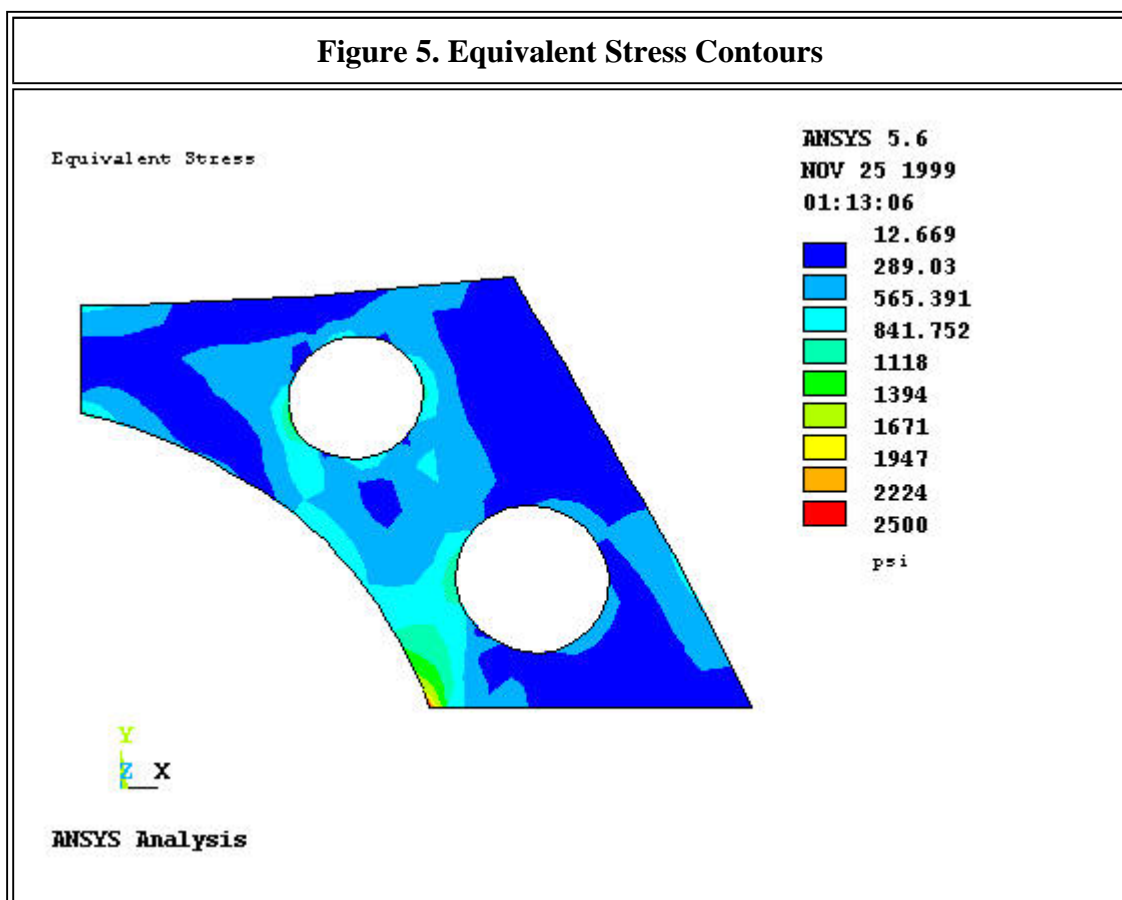
## Results Information

The following figures and tables show the response of the part *ribgeom* to the load environment *Environment 1* . The maximum total displacement is 3.04658E-04 in and the maximum equivalent stress is 2499.9 psi .





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**Table 4. Sum of the Reaction Forces**

Total Reaction Force [ lb ]		
X	Y	Z
-6.11987E-05	25.000	0.0000

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**Table 5. Moment About the Global Origin Due to the Reactions**

Total Moment [ lb in ]		
X	Y	Z
0.0000	0.0000	50.000

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**Table 6. Displacements**

Displacements [ in ]				
	X	Y	Z	Vector Sum
<b>Maximum</b>	2.22830E-04	-3.04658E-04	0.0000	3.04658E-04

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**Table 7. Direct Stresses**

Direct Stresses [ psi ]			
	X	Y	Z
<b>Minimum</b>	-675.74	-2548.6	0.0000
<b>Maximum</b>	1075.6	492.73	0.0000

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**Table 8. Shear Stresses**

Shear Stresses [ psi ]			
	XY	YZ	XZ

<b>Minimum</b>	-340.23	0.0000	0.0000
<b>Maximum</b>	531.12	0.0000	0.0000

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**Table 9. Principal Stresses**

<b>Principal Stresses [ psi ]</b>			
	<b>1st</b>	<b>2nd</b>	<b>3rd</b>
<b>Minimum</b>	0.0000	-412.56	-2550.5
<b>Maximum</b>	1076.0	117.35	0.0000

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**Table 10. Stress Intensity and Equivalent Stress**

<b>Stress Intensity and Equivalent Stress [ psi ]</b>		
	<b>Stress Intensity</b>	<b>Equivalent Stress</b>
<b>Minimum</b>	13.512	12.669
<b>Maximum</b>	2550.5	2499.9

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**Caution:** Do not accept or reject a design based solely on the results shown here. ANSYS, Inc. recommends that you also take into account experimental test data and/or prior experience with similar analyses when evaluating a design.

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