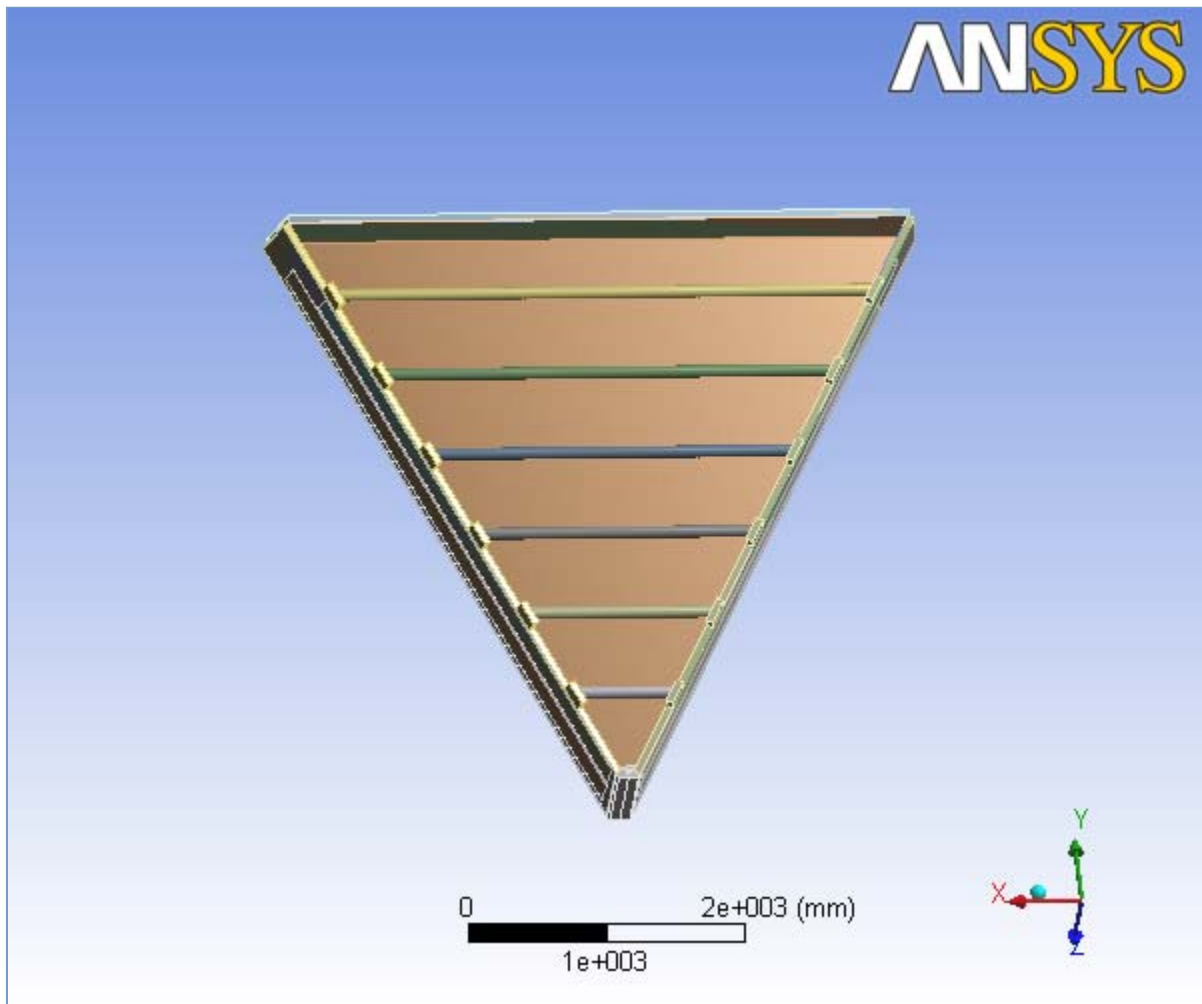




## **R3 Analysis Sector 1 with 3.5 inch 0.3 inch thick carbon rods**

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<i>Subject</i>	<i>Sector 1 with corrected axis and corrected engineering data</i>
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## Units

**TABLE 1**

Unit System	Metric (mm, kg, N, °C, s, mV, mA)
Angle	Degrees
Rotational Velocity	rad/s

## Sector 1

### Geometry

**TABLE 2**  
**Sector 1 > Geometry**

Object Name	<i>Geometry</i>
State	Fully Defined
<b>Definition</b>	
Source	C:\Documents and Settings\Jinnuri\Desktop\website\AI slit\change of directions\2.agdb
Type	DesignModeler
Length Unit	Millimeters
Element Control	Program Controlled
Display Style	Part Color
<b>Bounding Box</b>	
Length X	4768.3 mm
Length Y	4080.2 mm

Length Z	1998.5 mm
<b>Properties</b>	
Volume	8.0544e+008 mm <sup>3</sup>
Mass	337.67 kg
<b>Statistics</b>	
Bodies	26
Active Bodies	26
Nodes	136756
Elements	41251
<b>Preferences</b>	
Import Solid Bodies	Yes
Import Surface Bodies	Yes
Import Line Bodies	Yes
Parameter Processing	Yes
Personal Parameter Key	DS
CAD Attribute Transfer	No
Named Selection Processing	No
Material Properties Transfer	No
CAD Associativity	Yes
Import Coordinate Systems	No
Reader Save Part File	No
Import Using Instances	Yes
Do Smart Update	No
Attach File Via Temp File	No
Analysis Type	3-D
Mixed Import Resolution	None
Enclosure and Symmetry Processing	Yes

**TABLE 3**  
**Sector 1 > Geometry > Parts**

Object Name	<i>Nose Plate</i>	<i>Right End Plate Upstream Hole Area</i>	<i>Right End Plate Downstream Hole Area</i>	<i>Right End Plate Aluminum Casing</i>	<i>Right End Plate Polyurethane</i>
State	Meshed				
<b>Graphics Properties</b>					
Visible	Yes				
Transparency	1				
<b>Definition</b>					
Suppressed	No				
Material	Aluminum	Polyurethane		Aluminum	Polyurethane
Stiffness Behavior	Flexible				
Nonlinear Material Effects	Yes				
Coordinate System	Global Coordinate System				
<b>Bounding Box</b>					
Length X	180.6 mm	2116.2 mm	1998.1 mm	2338.8 mm	2327.5 mm
Length Y	94.006 mm	3614.6 mm	3410. mm	4000.2 mm	3980.6 mm
Length Z	532.95 mm	1531.7 mm	1457.6 mm	1984. mm	1957.6 mm
<b>Properties</b>					

Volume	6.6335e+006 mm <sup>3</sup>	4.1332e+007 mm <sup>3</sup>	3.9784e+007 mm <sup>3</sup>	1.1673e+007 mm <sup>3</sup>	3.501e+007 mm <sup>3</sup>
Mass	17.91 kg	9.9198 kg	9.5482 kg	31.518 kg	8.4025 kg
Centroid X	-4.9797e-016 mm	-1128.2 mm	-1075.6 mm	-1178.1 mm	-1410.5 mm
Centroid Y	42.651 mm	1881.3 mm	1790.3 mm	1967.8 mm	2370.2 mm
Centroid Z	-266.72 mm	-1095.2 mm	-834.01 mm	-1169.5 mm	-1088.2 mm
Moment of Inertia Ip1	4.2744e+005 kg·mm <sup>2</sup>	1.5457e+007 kg·mm <sup>2</sup>	1.321e+007 kg·mm <sup>2</sup>	5.6821e+007 kg·mm <sup>2</sup>	2.1104e+007 kg·mm <sup>2</sup>
Moment of Inertia Ip2	4.4471e+005 kg·mm <sup>2</sup>	31455 kg·mm <sup>2</sup>	31513 kg·mm <sup>2</sup>	1.6143e+006 kg·mm <sup>2</sup>	2.242e+005 kg·mm <sup>2</sup>
Moment of Inertia Ip3	43603 kg·mm <sup>2</sup>	1.543e+007 kg·mm <sup>2</sup>	1.3183e+007 kg·mm <sup>2</sup>	5.522e+007 kg·mm <sup>2</sup>	2.0883e+007 kg·mm <sup>2</sup>
<b>Statistics</b>					
Nodes	819	2974	2633	2195	14243
Elements	366	1340	1185	787	6334

**TABLE 4**  
**Sector 1 > Geometry > Parts**

Object Name	<i>Right End Plate Inner Steel Slice</i>	<i>Right End Plate Outer Steel Slice</i>	<i>Left End Plate Downstream Hole Area</i>	<i>Left End Plate Upstream Hole Area</i>	<i>Left End Plate Aluminum Casing</i>
State	Meshed				
<b>Graphics Properties</b>					
Visible	Yes				
Transparency	1				
<b>Definition</b>					
Suppressed	No				
Material	Stainless steel	Polyurethane			Aluminum
Nonlinear Material Effects	Yes				
Coordinate System	Global Coordinate System				
Thickness	1.2192 mm				
Thickness Mode	Manual				
Stiffness Behavior	Flexible				
<b>Bounding Box</b>					
Length X	2294.8 mm	2159.8 mm	1973.8 mm	2338.9 mm	
Length Y	3974.8 mm	3690. mm	3368. mm	4000.3 mm	
Length Z	1984. mm	1562.8 mm	1437.5 mm	1983.2 mm	
<b>Properties</b>					
Volume	2.9149e+006 mm <sup>3</sup>	4.3107e+007 mm <sup>3</sup>	3.8462e+007 mm <sup>3</sup>	1.1673e+007 mm <sup>3</sup>	
Mass	23.319 kg	10.346 kg	9.2309 kg	31.518 kg	
Surface Area (approx.)	2.3908e+006 mm <sup>2</sup>				
Centroid X	1154.5 mm		1054. mm	1178.2 mm	
Centroid Y	1927. mm		1752.8 mm	1967.9 mm	
Centroid Z	-885.34 mm		-1046.1 mm	-1169. mm	
Moment of Inertia Ip1	1.68e+007 kg·mm <sup>2</sup>		1.2459e+007 kg·mm <sup>2</sup>	5.7352e+007 kg·mm <sup>2</sup>	
Moment of Inertia Ip2	34145 kg·mm <sup>2</sup>		29270 kg·mm <sup>2</sup>	1.5841e+006 kg·mm <sup>2</sup>	

Moment of Inertia Ip3			1.677e+007 kg·mm <sup>2</sup>	1.2434e+007 kg·mm <sup>2</sup>	5.5764e+007 kg·mm <sup>2</sup>
<b>Statistics</b>					
Nodes	168	167	3184	2531	2108
Elements	123	122	1452	1127	740

**TABLE 5**  
**Sector 1 > Geometry > Parts**

Object Name	<i>Left End Plate Polyurethane</i>	<i>Left End Plate Outer Steel Slice</i>	<i>Left End Plate Inner Steel Slice</i>	<i>Back Plate Aluminum Casing</i>	<i>Back Plate Polyurethane</i>
State	Meshed				
<b>Graphics Properties</b>					
Visible	Yes				
Transparency	1				
<b>Definition</b>					
Suppressed	No				
Material	Polyurethane	Stainless steel		Aluminum	Polyurethane
Stiffness Behavior	Flexible			Flexible	
Nonlinear Material Effects	Yes				
Coordinate System	Global Coordinate System				
Thickness		1.2192 mm			
Thickness Mode		Manual			
<b>Bounding Box</b>					
Length X	2327.6 mm	2294.9 mm		4678.4 mm	4655. mm
Length Y	3980.8 mm	3974.9 mm		185.06 mm	179.6 mm
Length Z	1956.7 mm	1983.2 mm		493.9 mm	474.66 mm
<b>Properties</b>					
Volume	3.4557e+007 mm <sup>3</sup>	2.9149e+006 mm <sup>3</sup>		5.1666e+006 mm <sup>3</sup>	1.1129e+008 mm <sup>3</sup>
Mass	8.2937 kg	23.319 kg		13.95 kg	26.71 kg
Centroid X	1403.5 mm			1.8531e-002 mm	3.8792e-002 mm
Centroid Y	2358.2 mm			3988.7 mm	3988.1 mm
Centroid Z	-1102.4 mm			-1748. mm	-1750.2 mm
Moment of Inertia Ip1	2.0726e+007 kg·mm <sup>2</sup>			7.7888e+005 kg·mm <sup>2</sup>	5.127e+005 kg·mm <sup>2</sup>
Moment of Inertia Ip2	2.3631e+005 kg·mm <sup>2</sup>			3.0062e+007 kg·mm <sup>2</sup>	4.7337e+007 kg·mm <sup>2</sup>
Moment of Inertia Ip3	2.0493e+007 kg·mm <sup>2</sup>			2.9289e+007 kg·mm <sup>2</sup>	4.6835e+007 kg·mm <sup>2</sup>
Surface Area (approx.)		2.3908e+006 mm <sup>2</sup>			
<b>Statistics</b>					
Nodes	13808	170	180	684	1063
Elements	6121	125	135	62	429

**TABLE 6**  
**Sector 1 > Geometry > Parts**

Object Name	<i>Back Plate Inner Steel Slice</i>	<i>Back Plate Outer Steel Slice</i>	<i>Rod 6</i>	<i>Rod 1</i>	<i>Rod 2</i>
State	Meshed				

Graphics Properties				
Visible	Yes			
Transparency	1			
Definition				
Suppressed	No			
Material	Stainless steel	Carbon fiber		
Nonlinear Material Effects	Yes			
Coordinate System	Global Coordinate System			
Thickness	1.2192 mm			
Thickness Mode	Manual			
Stiffness Behavior	Flexible			
Bounding Box				
Length X	4678.4 mm	3946.2 mm	734.86 mm	1377.1 mm
Length Y	136.19 mm	88.9 mm		
Length Z	480.03 mm	88.9 mm		
Properties				
Volume	2.7943e+006 mm <sup>3</sup>	3.9663e+006 mm <sup>3</sup>	6.9656e+005 mm <sup>3</sup>	1.3501e+006 mm <sup>3</sup>
Mass	22.354 kg	2.3005 kg	0.404 kg	0.78307 kg
Surface Area (approx.)	2.2919e+006 mm <sup>2</sup>			
Centroid X		6.0146e-009 mm	-2.4341e-011 mm	1.0623e-012 mm
Centroid Y		3351.4 mm	571.51 mm	1127. mm
Centroid Z		-1839.9 mm	-783.5 mm	-994.79 mm
Moment of Inertia Ip1		4075.6 kg·mm <sup>2</sup>	714.36 kg·mm <sup>2</sup>	1386.9 kg·mm <sup>2</sup>
Moment of Inertia Ip2		2.8772e+006 kg·mm <sup>2</sup>	16013 kg·mm <sup>2</sup>	1.143e+005 kg·mm <sup>2</sup>
Moment of Inertia Ip3		2.8772e+006 kg·mm <sup>2</sup>	16014 kg·mm <sup>2</sup>	1.143e+005 kg·mm <sup>2</sup>
Statistics				
Nodes	188	9640	21052	12290
Elements	143	1370	3132	1820

**TABLE 7**  
**Sector 1 > Geometry > Parts**

Object Name	<i>Rod 3</i>	<i>Rod 4</i>	<i>Rod 5</i>	<i>Hexcel</i>	<i>Hexcel Outer Carbon Fiber Slice</i>
State	Meshed				Hidden
Graphics Properties					
Visible	Yes				No
Transparency	1				
Definition					
Suppressed	No				
Material	Carbon fiber	Hexcel		Carbon fiber	
Stiffness Behavior	Flexible				
Nonlinear Material Effects	Yes				
Coordinate System	Global Coordinate System				

Thickness					0.254 mm
Thickness Mode					Manual
<b>Bounding Box</b>					
Length X	2019.4 mm	2661.7 mm	3303.9 mm	4681.3 mm	4665.4 mm
Length Y	88.9 mm			3974.6 mm	3960.1 mm
Length Z	88.9 mm			1540.7 mm	1504.3 mm
<b>Properties</b>					
Volume	2.0042e+006 mm <sup>3</sup>	2.6582e+006 mm <sup>3</sup>	3.3123e+006 mm <sup>3</sup>	3.9039e+008 mm <sup>3</sup>	2.5598e+006 mm <sup>3</sup>
Mass	1.1624 kg	1.5418 kg	1.9211 kg	11.255 kg	1.4847 kg
Centroid X	-1.7803e-010 mm	4.2247e-010 mm	1.4152e-009 mm	-5.0942e-012 mm	
Centroid Y	1683. mm	2239.1 mm	2795.2 mm	2677.4 mm	
Centroid Z	-1206.1 mm	-1417.4 mm	-1628.7 mm	-1023.1 mm	
Moment of Inertia Ip1	2059.1 kg-mm <sup>2</sup>	2731.3 kg-mm <sup>2</sup>	3403.5 kg-mm <sup>2</sup>	1.1686e+007 kg-mm <sup>2</sup>	
Moment of Inertia Ip2	3.7222e+005 kg-mm <sup>2</sup>	8.6713e+005 kg-mm <sup>2</sup>	1.6763e+006 kg-mm <sup>2</sup>	1.0248e+007 kg-mm <sup>2</sup>	
Moment of Inertia Ip3	3.7223e+005 kg-mm <sup>2</sup>	8.6714e+005 kg-mm <sup>2</sup>	1.6763e+006 kg-mm <sup>2</sup>	2.1931e+007 kg-mm <sup>2</sup>	
Surface Area (approx.)					1.0078e+007 mm <sup>2</sup>
<b>Statistics</b>					
Nodes	8530	8834	8100	20285	354
Elements	1288	1428	1150	9713	301

**TABLE 8**  
**Sector 1 > Geometry > Parts**

Object Name	Hexcel Inner Carbon Fiber Slice
State	Hidden
<b>Graphics Properties</b>	
Visible	No
<b>Definition</b>	
Suppressed	No
Material	Carbon fiber
Nonlinear Material Effects	Yes
Coordinate System	Global Coordinate System
Thickness	0.254 mm
Thickness Mode	Manual
<b>Bounding Box</b>	
Length X	4665.4 mm
Length Y	3960.9 mm
Length Z	1504.6 mm
<b>Properties</b>	
Volume	2.5599e+006 mm <sup>3</sup>
Mass	1.4847 kg
Surface Area(approx.)	1.0078e+007 mm <sup>2</sup>
<b>Statistics</b>	
Nodes	368
Elements	315

## Coordinate Systems

**TABLE 9**  
**Sector 1 > Coordinate Systems > Coordinate System**

Object Name	<i>Global Coordinate System</i>
State	Fully Defined
<b>Definition</b>	
Type	Cartesian
Ansys System Number	0.
<b>Origin</b>	
Origin X	0. mm
Origin Y	0. mm
Origin Z	0. mm
<b>Directional Vectors</b>	
X Axis Data	[ 1. 0. 0. ]
Y Axis Data	[ 0. 1. 0. ]
Z Axis Data	[ 0. 0. 1. ]

## Connections

**TABLE 10**  
**Sector 1 > Connections**

Object Name	<i>Connections</i>
State	Fully Defined
<b>Auto Detection</b>	
Generate Contact On Update	Yes
Tolerance Type	Slider
Tolerance Slider	0.
Tolerance Value	16.466 mm
Face/Face	Yes
Face/Edge	No
Edge/Edge	No
Priority	Include All
Same Body Grouping	Yes
Revolute Joints	Yes
Fixed Joints	Yes
<b>Transparency</b>	
Enabled	Yes

**TABLE 11**  
**Sector 1 > Connections > Contact Regions**

Object Name	<i>Bonded - Nose Plate To Right End Plate Aluminum Casing</i>	<i>Bonded - Nose Plate To Right End Plate Inner Steel Slice</i>	<i>Bonded - Nose Plate To Left End Plate Aluminum Casing</i>	<i>Bonded - Nose Plate To Left End Plate Inner Steel Slice</i>	<i>Bonded - Right End Plate Upstream Hole Area To Right End Plate Polyurethane</i>
State	Fully Defined				
<b>Scope</b>					
Scoping Method	Geometry Selection				
Contact	2 Faces	1 Face	2 Faces	1 Face	4 Faces
Target	2 Faces	1 Face	2 Faces	1 Face	4 Faces



Contact Bodies	Nose Plate				Right End Plate Upstream Hole Area
Target Bodies	Right End Plate Aluminum Casing	Right End Plate Inner Steel Slice	Left End Plate Aluminum Casing	Left End Plate Inner Steel Slice	Right End Plate Polyurethane
<b>Definition</b>					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
<b>Advanced</b>					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

**TABLE 12**  
**Sector 1 > Connections > Contact Regions**

Object Name	<i>Bonded - Right End Plate Upstream Hole Area To Right End Plate Inner Steel Slice</i>	<i>Bonded - Right End Plate Upstream Hole Area To Right End Plate Outer Steel Slice</i>	<i>Bonded - Right End Plate Downstream Hole Area To Right End Plate Polyurethane</i>	<i>Bonded - Right End Plate Downstream Hole Area To Right End Plate Inner Steel Slice</i>	<i>Bonded - Right End Plate Downstream Hole Area To Right End Plate Outer Steel Slice</i>
State	Fully Defined				
<b>Scope</b>					
Scoping Method	Geometry Selection				
Contact	1 Face		4 Faces		1 Face
Target	1 Face		4 Faces		1 Face
Contact Bodies	Right End Plate Upstream Hole Area		Right End Plate Downstream Hole Area		
Target Bodies	Right End Plate Inner Steel Slice	Right End Plate Outer Steel Slice	Right End Plate Polyurethane	Right End Plate Inner Steel Slice	Right End Plate Outer Steel Slice
<b>Definition</b>					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
<b>Advanced</b>					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

**TABLE 13**  
**Sector 1 > Connections > Contact Regions**

Object Name	<i>Bonded - Right End Plate Aluminum Casing To Right End Plate Polyurethane</i>	<i>Bonded - Right End Plate Aluminum Casing To Right End Plate Inner Steel Slice</i>	<i>Bonded - Right End Plate Aluminum Casing To Right End Plate Outer Steel Slice</i>	<i>Bonded - Right End Plate Polyurethane To Right End Plate Inner Steel Slice</i>	<i>Bonded - Right End Plate Polyurethane To Right End Plate Outer Steel Slice</i>
State	Fully Defined				
<b>Scope</b>					
Scoping Method	Geometry Selection				
Contact	4 Faces	1 Face			
Target	4 Faces	1 Face			
Contact Bodies	Right End Plate Aluminum Casing			Right End Plate Polyurethane	
Target Bodies	Right End Plate Polyurethane	Right End Plate Inner Steel Slice	Right End Plate Outer Steel Slice	Right End Plate Inner Steel Slice	Right End Plate Outer Steel Slice
<b>Definition</b>					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
<b>Advanced</b>					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

**TABLE 14**  
**Sector 1 > Connections > Contact Regions**

Object Name	<i>Bonded - Left End Plate Downstream Hole Area To Left End Plate Polyurethane</i>	<i>Bonded - Left End Plate Downstream Hole Area To Left End Plate Outer Steel Slice</i>	<i>Bonded - Left End Plate Downstream Hole Area To Left End Plate Inner Steel Slice</i>	<i>Bonded - Left End Plate Upstream Hole Area To Left End Plate Polyurethane</i>	<i>Bonded - Left End Plate Upstream Hole Area To Left End Plate Outer Steel Slice</i>
State	Fully Defined				
<b>Scope</b>					
Scoping Method	Geometry Selection				
Contact	4 Faces	1 Face		4 Faces	1 Face
Target	4 Faces	1 Face		4 Faces	1 Face
Contact Bodies	Left End Plate Downstream Hole Area			Left End Plate Upstream Hole Area	
Target Bodies	Left End Plate Polyurethane	Left End Plate Outer Steel Slice	Left End Plate Inner Steel Slice	Left End Plate Polyurethane	Left End Plate Outer Steel Slice
<b>Definition</b>					

Type	Bonded
Scope Mode	Automatic
Behavior	Symmetric
Suppressed	No
<b>Advanced</b>	
Formulation	Pure Penalty
Normal Stiffness	Program Controlled
Update Stiffness	Never
Thermal Conductance	Program Controlled
Pinball Region	Program Controlled

**TABLE 15**  
**Sector 1 > Connections > Contact Regions**

Object Name	<i>Bonded - Left End Plate Upstream Hole Area To Left End Plate Inner Steel Slice</i>	<i>Bonded - Left End Plate Aluminum Casing To Left End Plate Polyurethane</i>	<i>Bonded - Left End Plate Aluminum Casing To Left End Plate Outer Steel Slice</i>	<i>Bonded - Left End Plate Aluminum Casing To Left End Plate Inner Steel Slice</i>	<i>Bonded - Left End Plate Polyurethane To Left End Plate Outer Steel Slice</i>
State	Fully Defined				
<b>Scope</b>					
Scoping Method	Geometry Selection				
Contact	1 Face	4 Faces	1 Face		
Target	1 Face	4 Faces	1 Face		
Contact Bodies	Left End Plate Upstream Hole Area	Left End Plate Aluminum Casing			Left End Plate Polyurethane
Target Bodies	Left End Plate Inner Steel Slice	Left End Plate Polyurethane	Left End Plate Outer Steel Slice	Left End Plate Inner Steel Slice	Left End Plate Outer Steel Slice
<b>Definition</b>					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
<b>Advanced</b>					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

**TABLE 16**  
**Sector 1 > Connections > Contact Regions**

	<i>Bonded - Left End</i>	<i>Bonded - Back</i>	<i>Bonded - Back</i>	<i>Bonded - Back</i>	<i>Bonded - Back Plate Aluminum</i>
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Object Name	<i>Plate Polyurethane To Left End Plate Inner Steel Slice</i>	<i>Plate Aluminum Casing To Back Plate Polyurethane</i>	<i>Plate Polyurethane To Back Plate Inner Steel Slice</i>	<i>Plate Polyurethane To Back Plate Outer Steel Slice</i>	<i>Casing To Right End Plate Aluminum Casing</i>
State	Fully Defined				
<b>Scope</b>					
Scoping Method	Geometry Selection				
Contact	1 Face	4 Faces	1 Face	3 Faces	1 Edge
Target	1 Face	4 Faces	1 Face		1 Edge
Contact Bodies	Left End Plate Polyurethane	Back Plate Aluminum Casing	Back Plate Polyurethane		Back Plate Aluminum Casing
Target Bodies	Left End Plate Inner Steel Slice	Back Plate Polyurethane	Back Plate Inner Steel Slice	Back Plate Outer Steel Slice	Right End Plate Aluminum Casing
<b>Definition</b>					
Type	Bonded				
Scope Mode	Automatic				Manual
Behavior	Symmetric				
Suppressed	No				
<b>Advanced</b>					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				Radius
Pinball Radius					20. mm

**TABLE 17**  
**Sector 1 > Connections > Contact Regions**

Object Name	<i>Bonded - Back Plate Aluminum Casing To Left End Plate Aluminum Casing</i>	<i>Bonded - Right End Plate Aluminum Casing To Rod 6</i>	<i>Bonded - Left End Plate Aluminum Casing To Rod 6</i>	<i>Bonded - Back Plate Aluminum Casing To Back Plate Inner Steel Slice</i>	<i>Bonded - Back Plate Aluminum Casing To Back Plate Outer Steel Slice</i>
State	Fully Defined				
<b>Scope</b>					
Scoping Method	Geometry Selection				
Contact	1 Edge	1 Face			
Target	1 Edge	1 Face			
Contact Bodies	Back Plate Aluminum Casing	Right End Plate Aluminum Casing	Left End Plate Aluminum Casing	Back Plate Aluminum Casing	
Target Bodies	Left End Plate Aluminum Casing	Rod 6		Back Plate Inner Steel Slice	Back Plate Outer Steel Slice
<b>Definition</b>					
Type	Bonded				

Scope Mode	Manual	Automatic
Suppressed	No	
Behavior	Symmetric	
<b>Advanced</b>		
Formulation	Pure Penalty	
Normal Stiffness	Program Controlled	
Update Stiffness	Never	
Thermal Conductance	Program Controlled	
Pinball Region	Radius	Program Controlled
Pinball Radius	20. mm	

**TABLE 18**  
**Sector 1 > Connections > Contact Regions**

Object Name	<i>Bonded - Nose Plate To Right End Plate Polyurethane</i>	<i>Bonded - Nose Plate To Left End Plate Polyurethane</i>	<i>Bonded - Right End Plate Aluminum Casing To Rod 1</i>	<i>Bonded - Right End Plate Aluminum Casing To Rod 2</i>	<i>Bonded - Right End Plate Aluminum Casing To Rod 3</i>
State	Fully Defined				
<b>Scope</b>					
Scoping Method	Geometry Selection				
Contact	2 Faces		1 Face		
Target	2 Faces		1 Face		
Contact Bodies	Nose Plate		Right End Plate Aluminum Casing		
Target Bodies	Right End Plate Polyurethane	Left End Plate Polyurethane	Rod 1	Rod 2	Rod 3
<b>Definition</b>					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
<b>Advanced</b>					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

**TABLE 19**  
**Sector 1 > Connections > Contact Regions**

Object Name	<i>Bonded - Right End Plate Aluminum Casing To Rod 4</i>	<i>Bonded - Right End Plate Aluminum Casing To Rod 5</i>	<i>Bonded - Left End Plate Aluminum Casing To Rod 1</i>	<i>Bonded - Left End Plate Aluminum Casing To Rod 2</i>	<i>Bonded - Left End Plate Aluminum Casing To Rod 3</i>
State	Fully Defined				
<b>Scope</b>					

Scoping Method	Geometry Selection				
Contact	1 Face				
Target	1 Face				
Contact Bodies	Right End Plate Aluminum Casing		Left End Plate Aluminum Casing		
Target Bodies	Rod 4	Rod 5	Rod 1	Rod 2	Rod 3
<b>Definition</b>					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
<b>Advanced</b>					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

**TABLE 20**  
**Sector 1 > Connections > Contact Regions**

Object Name	<i>Bonded - Left End Plate Aluminum Casing To Rod 4</i>	<i>Bonded - Left End Plate Aluminum Casing To Rod 5</i>	<i>Bonded - Right End Plate Inner Steel Slice To Hexcel</i>	<i>Bonded - Left End Plate Aluminum Casing To Hexcel</i>	<i>Bonded - Back Plate Aluminum Casing To Hexcel</i>
State	Fully Defined				
<b>Scope</b>					
Scoping Method	Geometry Selection				
Contact	1 Face				1 Edge
Target	1 Face				1 Edge
Contact Bodies	Left End Plate Aluminum Casing		Right End Plate Inner Steel Slice	Left End Plate Aluminum Casing	Back Plate Aluminum Casing
Target Bodies	Rod 4	Rod 5	Hexcel		
<b>Definition</b>					
Type	Bonded				
Scope Mode	Automatic		Manual		
Behavior	Symmetric				
Suppressed	No				
<b>Advanced</b>					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled		Radius		Program Controlled
Pinball Radius			5. mm		

**TABLE 21**  
**Sector 1 > Connections > Contact Regions**

Object Name	<i>Bonded - Left End Plate Aluminum Casing To Hexcel</i>	<i>Bonded - Right End Plate Polyurethane To Right End Plate Outer Steel Slice</i>	<i>Bonded - Back Plate Polyurethane To Back Plate Outer Steel Slice</i>	<i>Bonded - Hexcel Inner Carbon Fiber Slice To Hexcel</i>	<i>Bonded - Hexcel Outer Carbon Fiber Slice To Hexcel</i>
State	Fully Defined				
<b>Scope</b>					
Scoping Method	Geometry Selection				
Contact	1 Edge	1 Face			
Target	1 Edge	1 Face			
Contact Bodies	Left End Plate Aluminum Casing	Right End Plate Polyurethane	Back Plate Polyurethane	Hexcel Inner Carbon Fiber Slice	Hexcel Outer Carbon Fiber Slice
Target Bodies	Hexcel	Right End Plate Outer Steel Slice	Back Plate Outer Steel Slice	Hexcel	
<b>Definition</b>					
Type	Bonded				
Scope Mode	Manual				
Suppressed	No				
Behavior	Symmetric				
<b>Advanced</b>					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

**TABLE 22**  
**Sector 1 > Connections > Contact Regions**

Object Name	<i>Contact Region 56</i>	<i>Contact Region 57</i>	<i>Contact Region 58</i>	<i>Contact Region 59</i>	<i>Contact Region 60</i>
State	Fully Defined				
<b>Scope</b>					
Scoping Method	Geometry Selection				
Contact	1 Face				
Target	1 Face				
Contact Bodies	Right End Plate Aluminum Casing	Right End Plate Polyurethane	Right End Plate Inner Steel Slice	Left End Plate Aluminum Casing	Left End Plate Polyurethane
Target Bodies	Hexcel				
<b>Definition</b>					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
<b>Advanced</b>					
Formulation	Pure Penalty				
Normal	Program Controlled				

Stiffness	
Update Stiffness	Never
Thermal Conductance	Program Controlled
Pinball Region	Program Controlled

**TABLE 23**  
**Sector 1 > Connections > Contact Regions**

Object Name	Contact Region 61	Contact Region 62	Contact Region 63	Contact Region 64	Contact Region 65
State	Fully Defined				
<b>Scope</b>					
Scoping Method	Geometry Selection				
Contact	1 Face	2 Faces		1 Face	
Target	1 Face	2 Faces		1 Face	
Contact Bodies	Left End Plate Inner Steel Slice	Back Plate Aluminum Casing	Back Plate Polyurethane	Back Plate Inner Steel Slice	Hexcel
Target Bodies	Hexcel				Hexcel Outer Carbon Fiber Slice
<b>Definition</b>					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
<b>Advanced</b>					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

**TABLE 24**  
**Sector 1 > Connections > Contact Regions**

Object Name	Contact Region 66	Contact Region 67
State	Fully Defined	
<b>Scope</b>		
Scoping Method	Geometry Selection	
Contact	1 Face	
Target	1 Face	
Contact Bodies	Hexcel	Hexcel Outer Carbon Fiber Slice
Target Bodies	Hexcel Inner Carbon Fiber Slice	
<b>Definition</b>		
Type	Bonded	
Scope Mode	Automatic	
Behavior	Symmetric	
Suppressed	No	
<b>Advanced</b>		
Formulation	Pure Penalty	
Normal Stiffness	Program Controlled	



Update Stiffness	Never
Thermal Conductance	Program Controlled
Pinball Region	Program Controlled

## Mesh

**TABLE 25**  
**Sector 1 > Mesh**

Object Name	<i>Mesh</i>
State	Solved
<b>Defaults</b>	
Physics Preference	Mechanical
Relevance	-35
<b>Advanced</b>	
Relevance Center	Coarse
Element Size	Default
Shape Checking	Standard Mechanical
Solid Element Midside Nodes	Program Controlled
Straight Sided Elements	No
Initial Size Seed	Active Assembly
Smoothing	Low
Transition	Fast
<b>Statistics</b>	
Nodes	136756
Elements	41251

**TABLE 26**  
**Sector 1 > Mesh > Mesh Controls**

Object Name	<i>Refinement 2</i>	<i>Refinement 4</i>	<i>Refinement</i>
State	Fully Defined		
<b>Scope</b>			
Scoping Method	Geometry Selection		
Geometry	6 Faces	2 Faces	6 Faces
<b>Definition</b>			
Suppressed	No		
Refinement	1		

## Static Structural

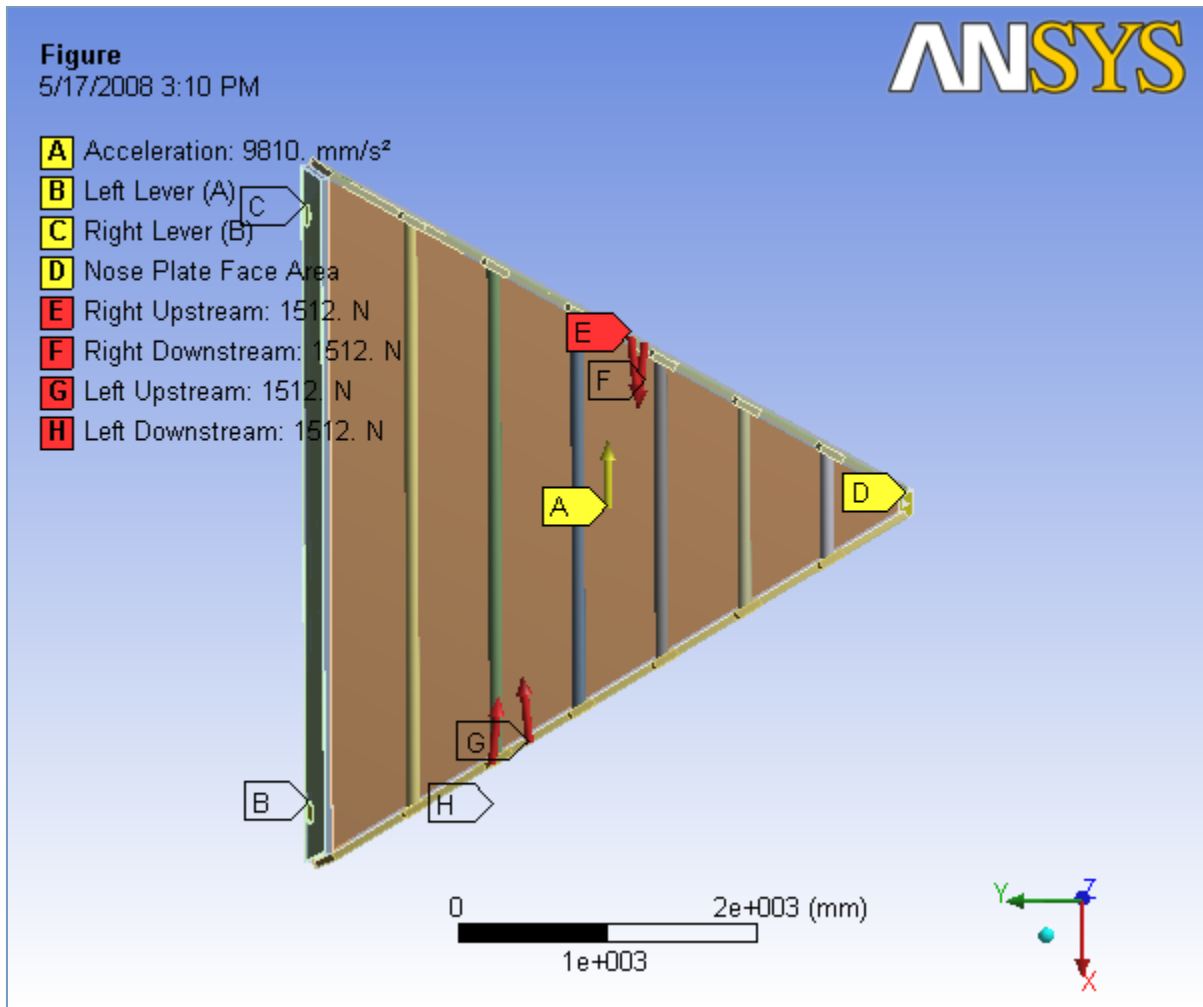
**TABLE 27**  
**Sector 1 > Analysis**

Object Name	<i>Static Structural</i>
State	Fully Defined
<b>Definition</b>	
Physics Type	Structural
Analysis Type	Static Structural
<b>Options</b>	
Reference Temp	22. °C

**TABLE 28**  
**Sector 1 > Static Structural > Analysis Settings**

Object Name	<i>Analysis Settings</i>
State	Fully Defined
<b>Step Controls</b>	
Number Of Steps	1.
Current Step Number	1.
Step End Time	1. s
Auto Time Stepping	Program Controlled
<b>Solver Controls</b>	
Solver Type	Direct
Weak Springs	Program Controlled
Large Deflection	Off
Inertia Relief	Off
<b>Nonlinear Controls</b>	
Force Convergence	Program Controlled
Moment Convergence	Program Controlled
Displacement Convergence	Program Controlled
Rotation Convergence	Program Controlled
Line Search	Program Controlled
<b>Output Controls</b>	
Calculate Stress	Yes
Calculate Strain	Yes
Calculate Results At	All Time Points
<b>Analysis Data Management</b>	
Solver Files Directory	C:\Documents and Settings\Jinnuri\Desktop\website\AI slit\change of directions\2 Simulation Files\Static Structural\
Future Analysis	None
Save ANSYS db	No
Delete Unneeded Files	Yes
Nonlinear Solution	No

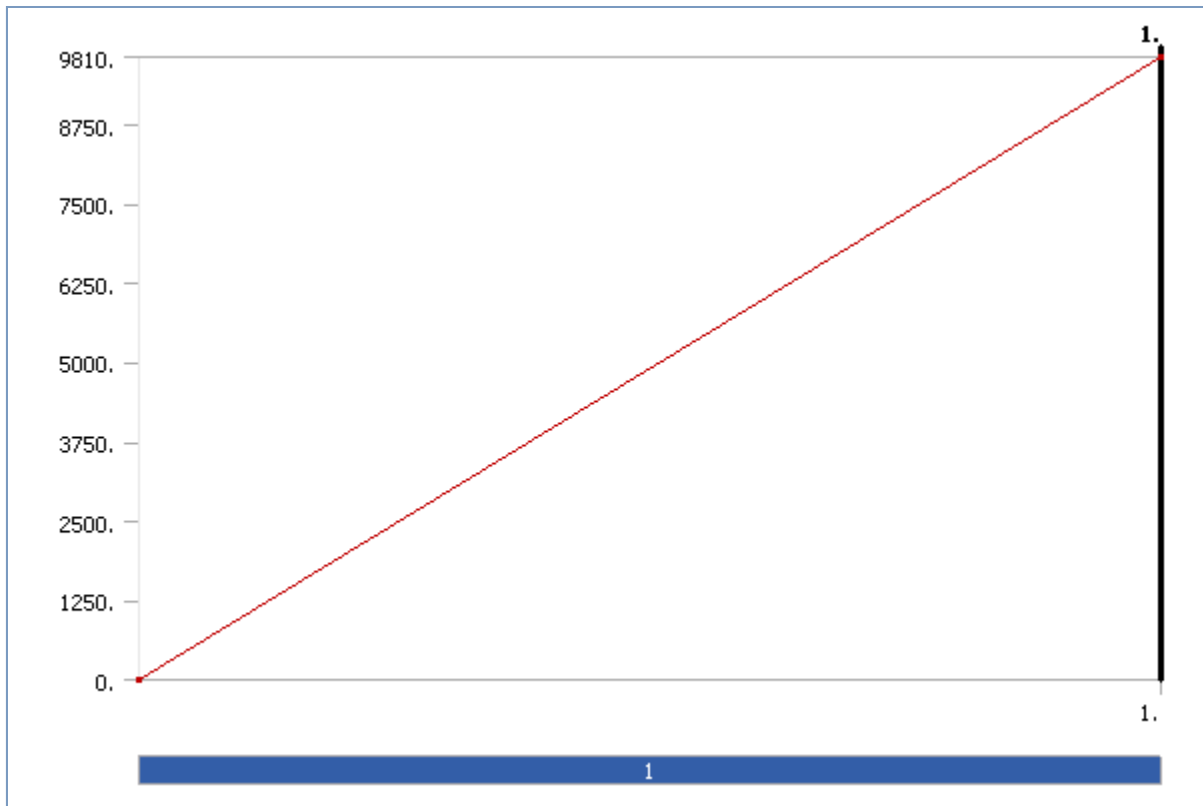
**FIGURE 1**  
Sector 1 > Static Structural > Figure



**TABLE 29**  
**Sector 1 > Static Structural > Accelerations**

Object Name	<i>Acceleration</i>
State	Fully Defined
<b>Scope</b>	
Geometry	All Bodies
<b>Definition</b>	
Define By	Vector
Magnitude	9810. mm/s <sup>2</sup> (ramped)
Direction	Defined
Suppressed	No

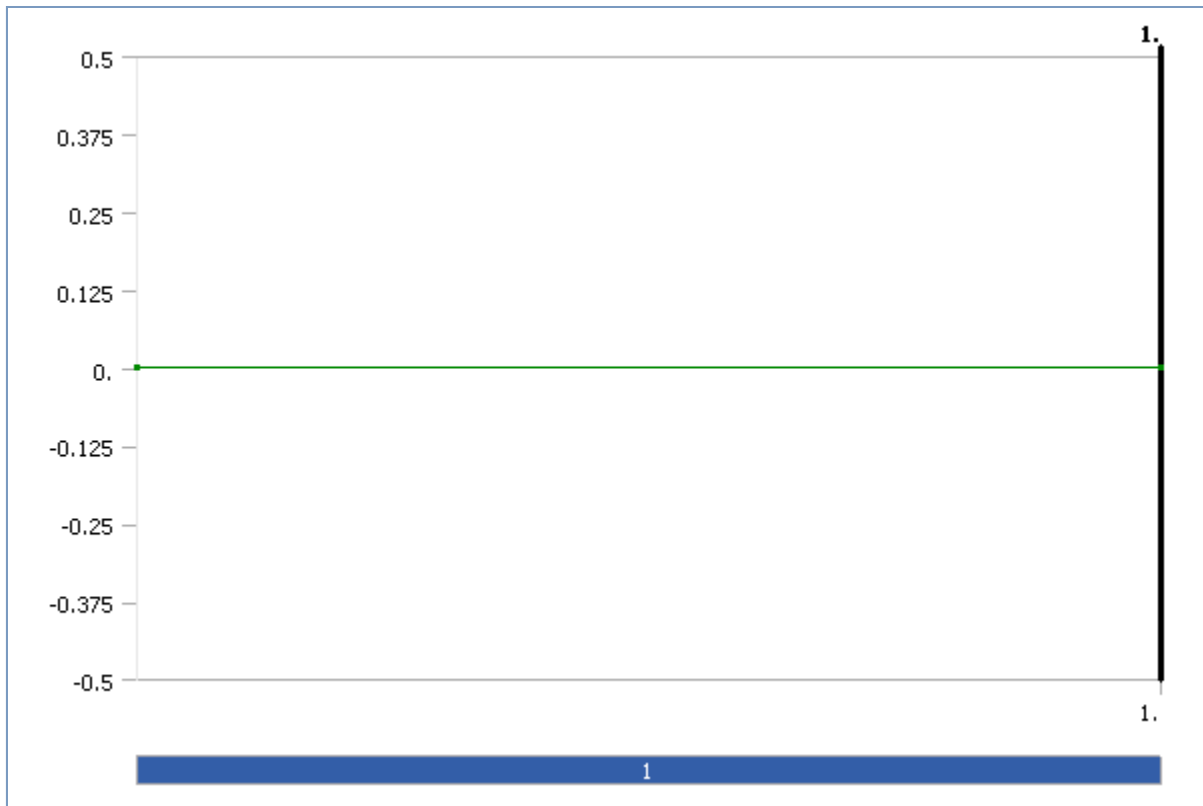
**FIGURE 2**  
**Sector 1 > Static Structural > Acceleration**



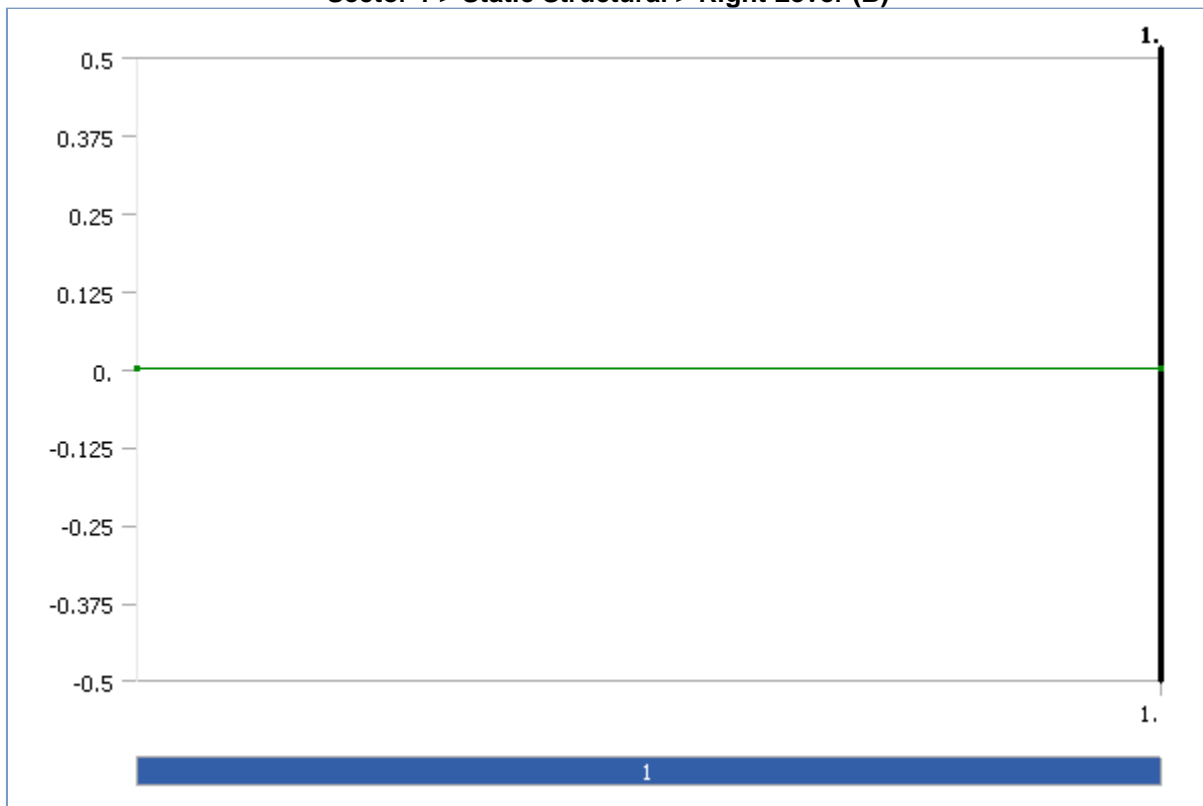
**TABLE 30**  
Sector 1 > Static Structural > Loads

Object Name	<i>Left Lever (A)</i>	<i>Right Lever (B)</i>	<i>Nose Plate Face Area</i>	<i>Right Upstream</i>	<i>Right Downstream</i>
State	Fully Defined				
<b>Scope</b>					
Scoping Method	Geometry Selection				
Geometry	1 Face				
<b>Definition</b>					
Define By	Components				
Type	Displacement			Force	
Coordinate System	Global Coordinate System				
X Component	Free	0. mm (ramped)		1503.7 N (ramped)	
Y Component	0. mm (ramped)	Free		-158.05 N (ramped)	158.05 N (ramped)
Z Component	0. mm (ramped)			0. N (ramped)	
Suppressed	No				

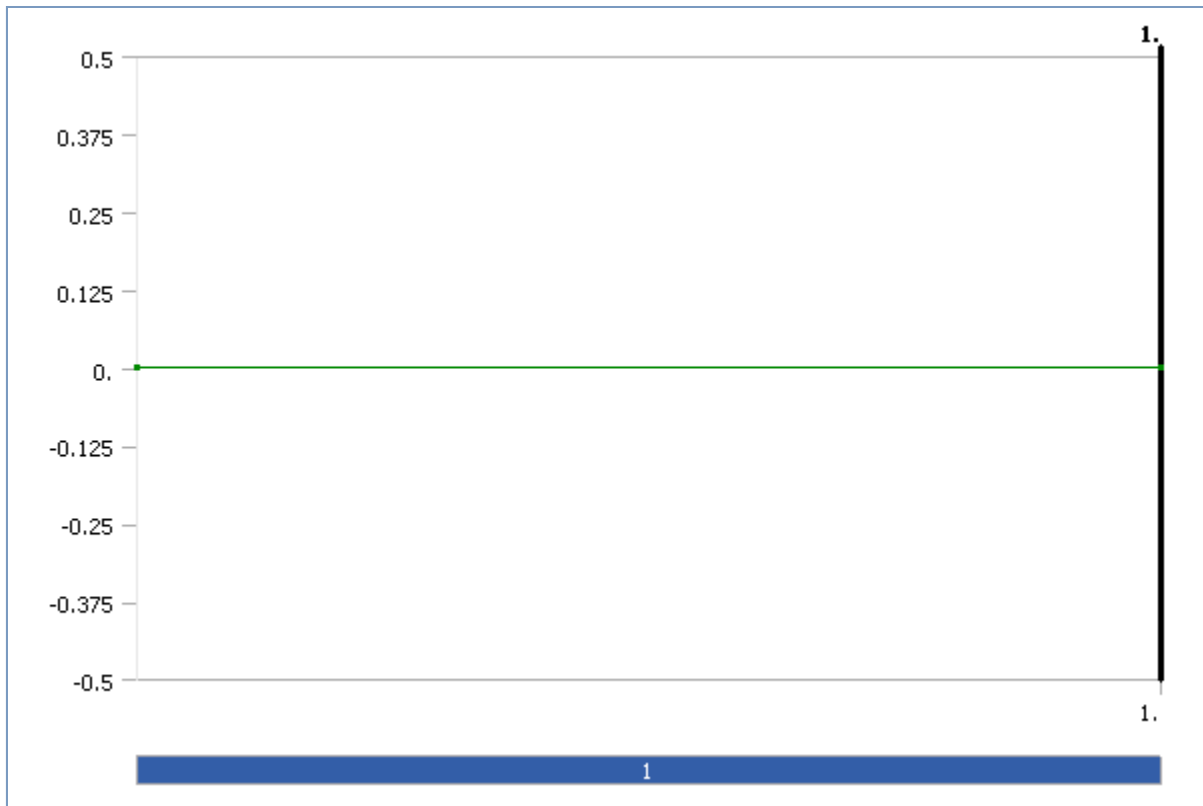
**FIGURE 3**  
Sector 1 > Static Structural > Left Lever (A)



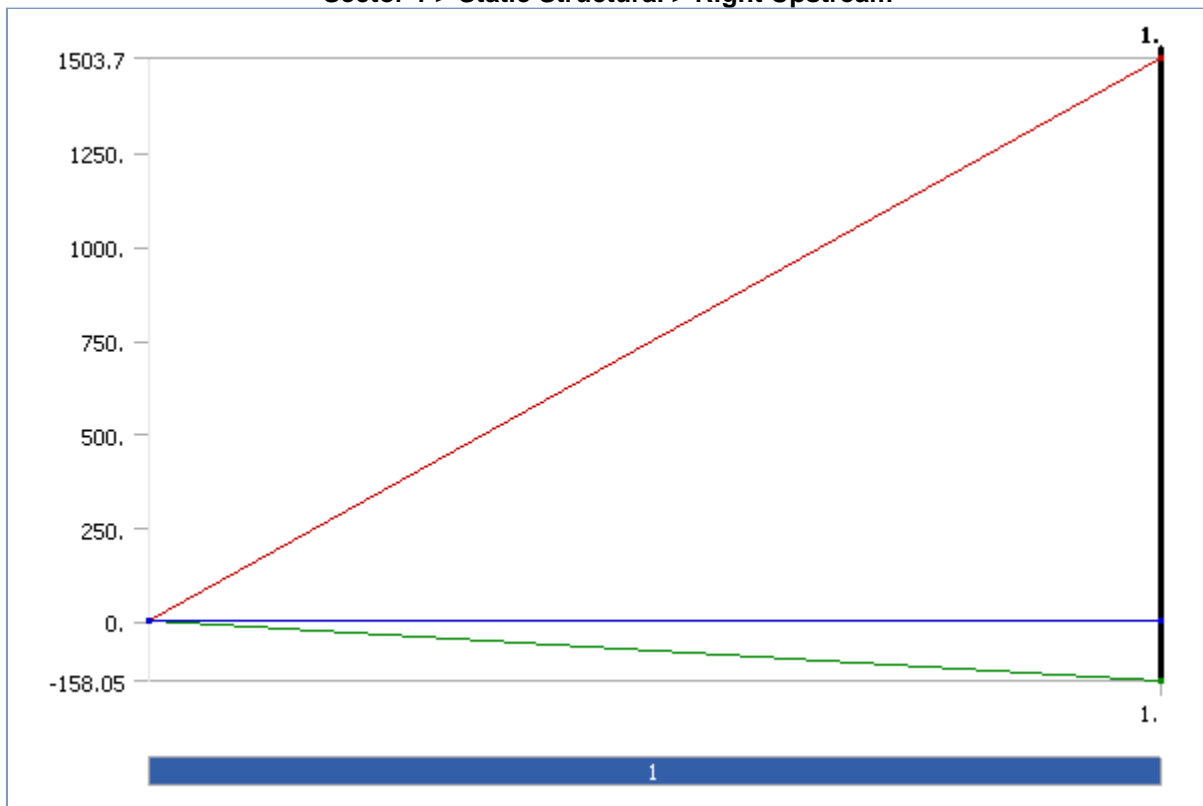
**FIGURE 4**  
**Sector 1 > Static Structural > Right Lever (B)**



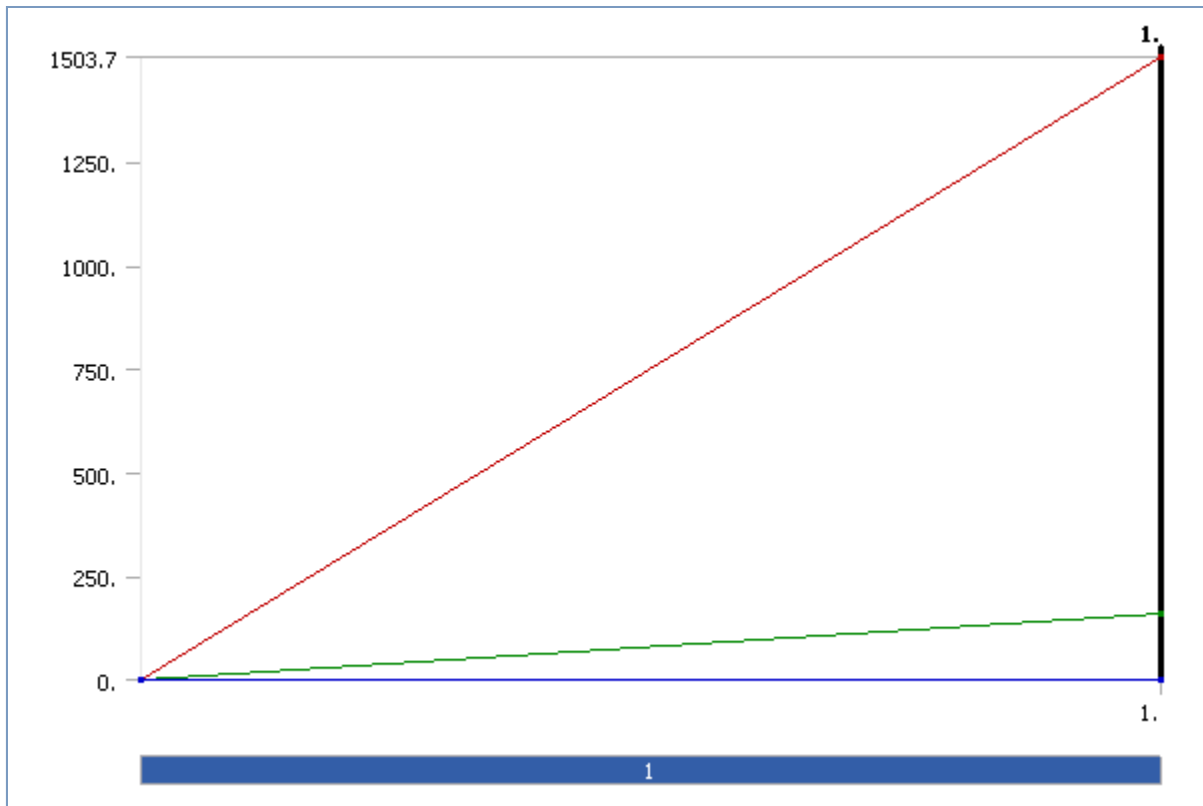
**FIGURE 5**  
**Sector 1 > Static Structural > Nose Plate Face Area**



**FIGURE 6**  
Sector 1 > Static Structural > Right Upstream



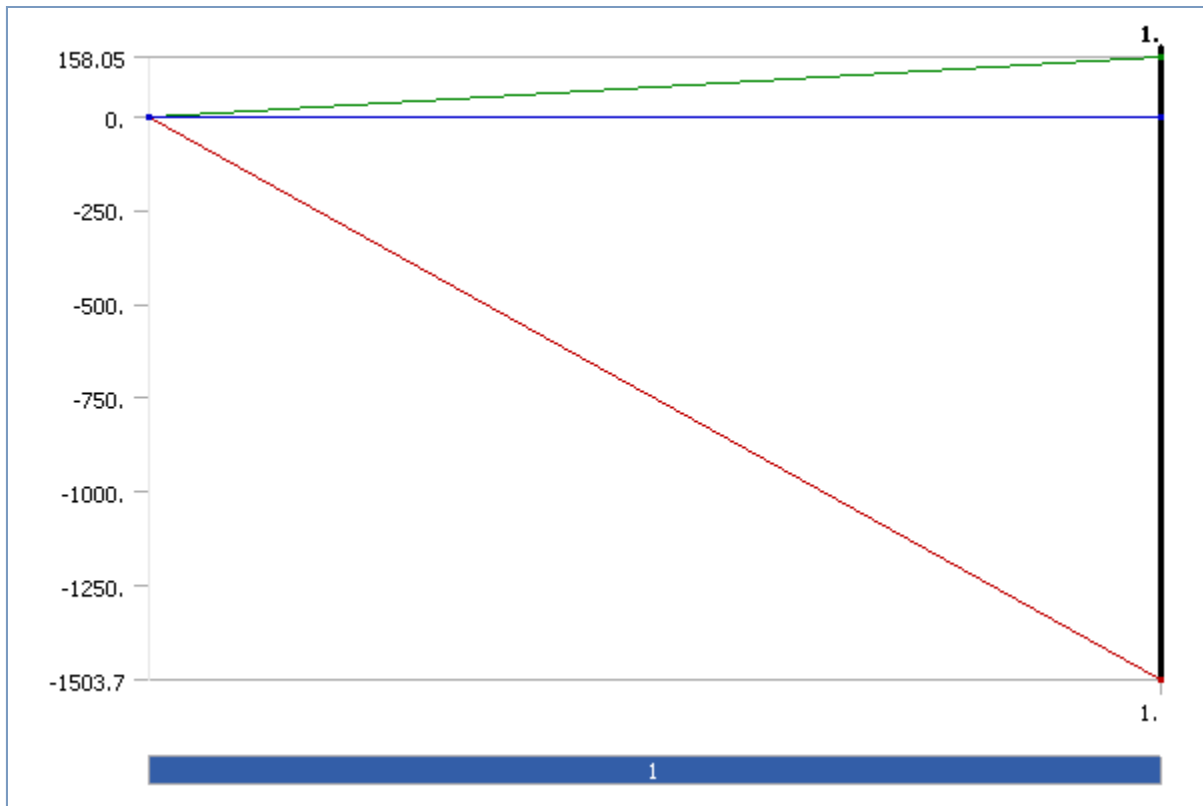
**FIGURE 7**  
Sector 1 > Static Structural > Right Downstream



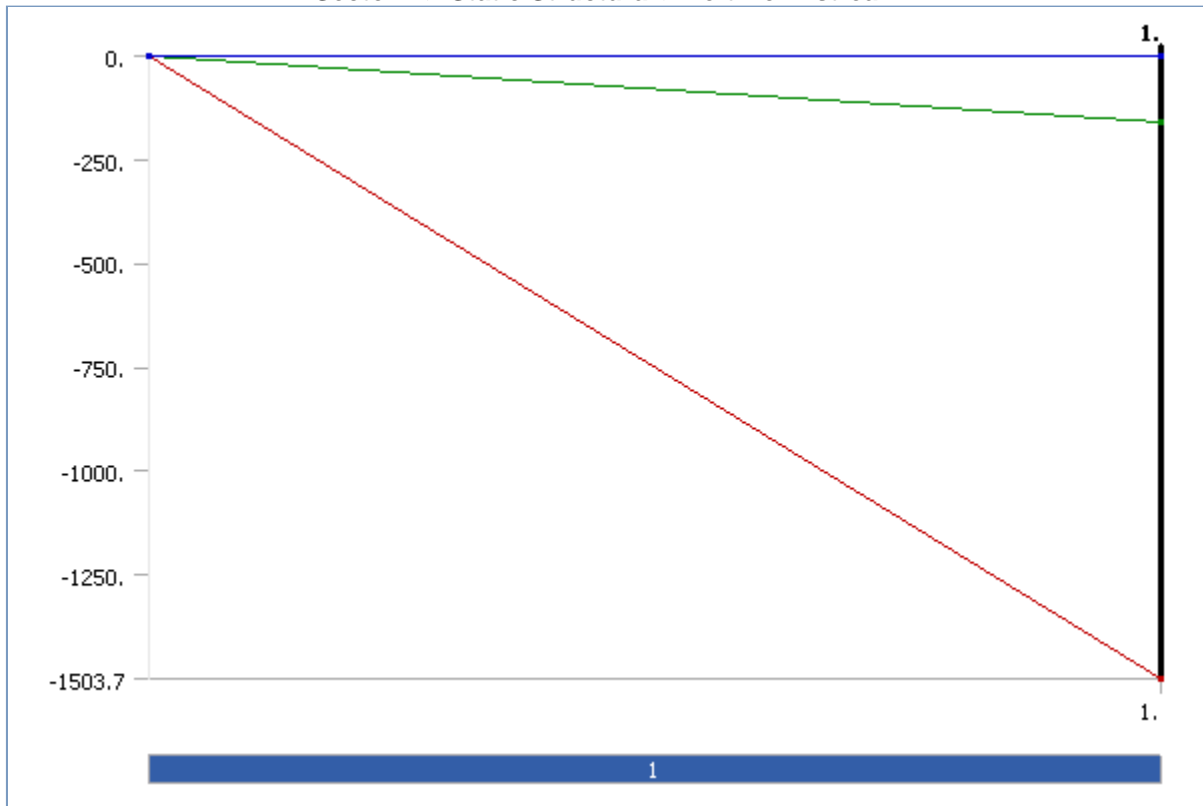
**TABLE 31**  
Sector 1 > Static Structural > Loads

Object Name	<i>Left Upstream</i>	<i>Left Downstream</i>
State	Fully Defined	
<b>Scope</b>		
Scoping Method	Geometry Selection	
Geometry	1 Face	
<b>Definition</b>		
Define By	Components	
Type	Force	
Coordinate System	Global Coordinate System	
X Component	-1503.7 N (ramped)	
Y Component	158.05 N (ramped)	-158.05 N (ramped)
Z Component	0. N (ramped)	
Suppressed	No	

**FIGURE 8**  
Sector 1 > Static Structural > Left Upstream



**FIGURE 9**  
Sector 1 > Static Structural > Left Downstream



**Solution**



**TABLE 32**  
Sector 1 > Static Structural > Solution

Object Name	<i>Solution</i>
State	Solved
<b>Adaptive Mesh Refinement</b>	
Max Refinement Loops	1.
Refinement Depth	2.

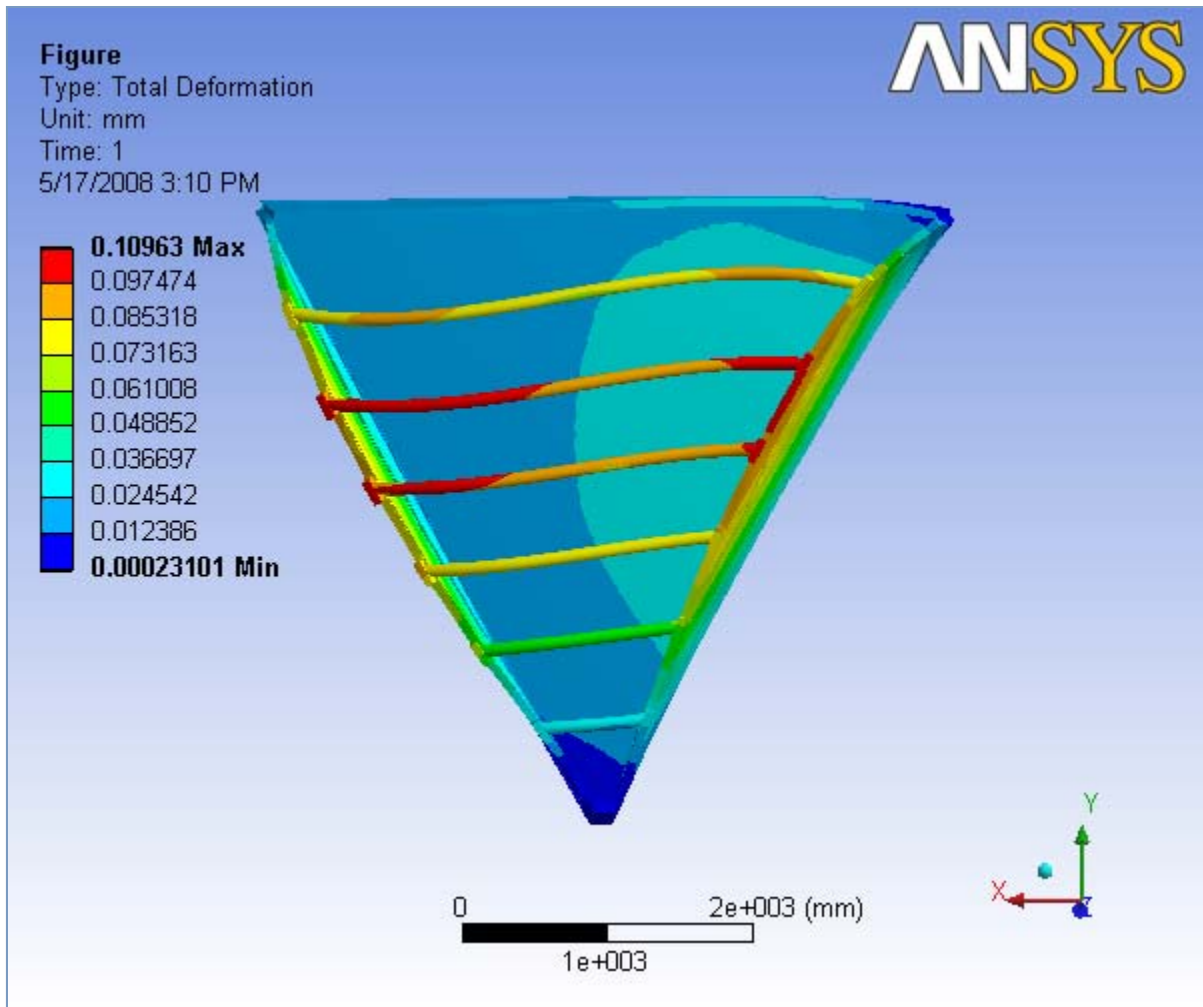
**TABLE 33**  
Sector 1 > Static Structural > Solution > Solution Information

Object Name	<i>Solution Information</i>
State	Solved
<b>Solution Information</b>	
Solution Output	Solver Output
Newton-Raphson Residuals	0
Update Interval	2.5 s
Display Points	All

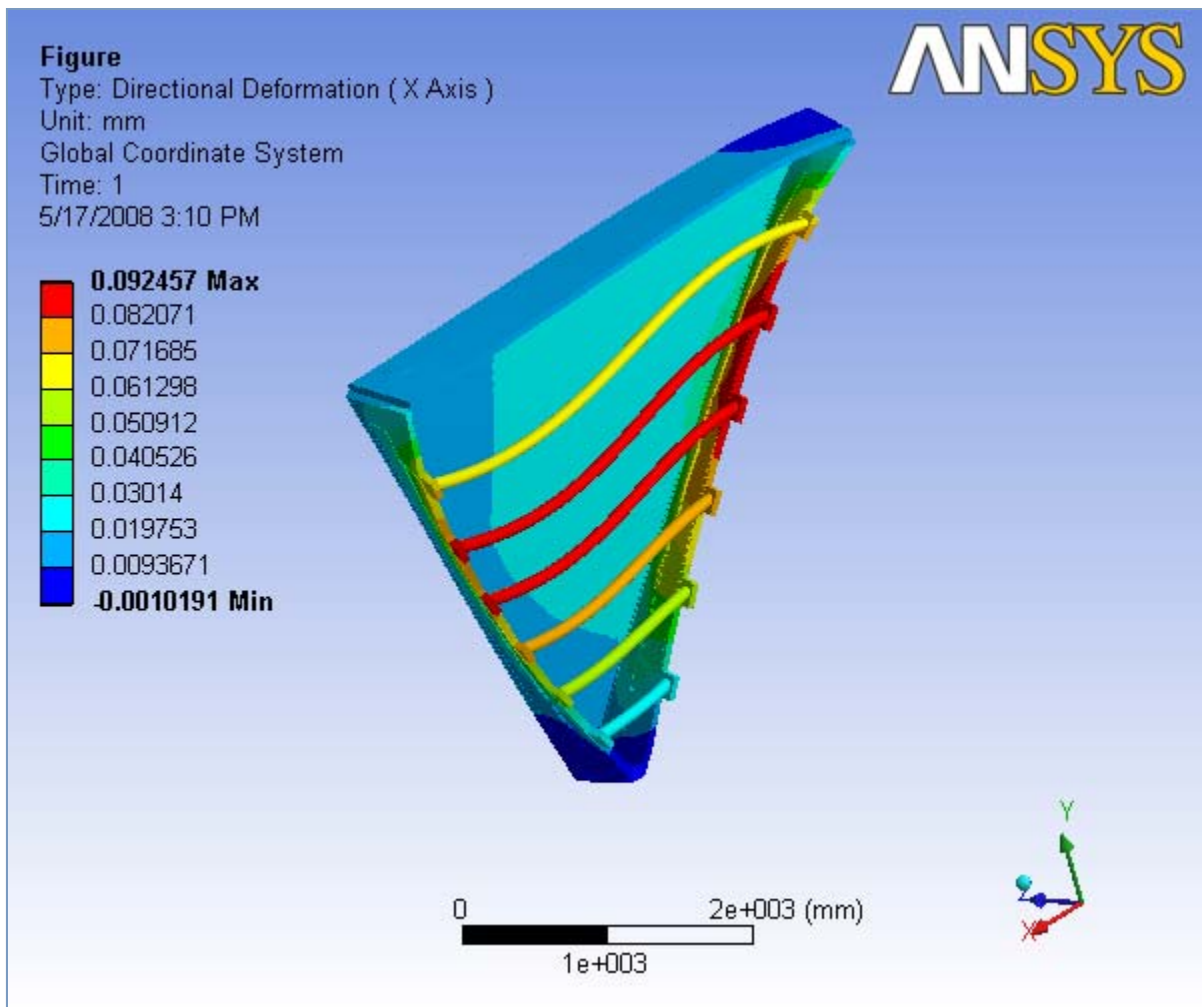
**TABLE 34**  
Sector 1 > Static Structural > Solution > Results

Object Name	<i>Total Deformation</i>	<i>X - Directional Deformation</i>	<i>Y - Directional Deformation</i>	<i>Z - Directional Deformation</i>	<i>Equivalent Stress</i>
State	Solved				
<b>Scope</b>					
Geometry	All Bodies				
<b>Definition</b>					
Type	Total Deformation	Directional Deformation			Equivalent (von-Mises) Stress
Display Time	End Time				
Orientation		X Axis	Y Axis	Z Axis	
Coordinate System	Global Coordinate System				
Shell	Top/Bottom				
<b>Results</b>					
Minimum	2.3101e-004 mm	-1.0191e-003 mm	-5.3376e-002 mm	-4.8164e-002 mm	1.5295e-005 MPa
Maximum	0.10963 mm	9.2457e-002 mm	5.4936e-002 mm	8.6557e-003 mm	3.4643 MPa
Minimum Occurs On	Nose Plate	Left End Plate Outer Steel Slice	Rod 5		Hexcel
Maximum Occurs On	Rod 5	Left End Plate Aluminum Casing	Rod 6	Left End Plate Outer Steel Slice	Back Plate Outer Steel Slice
<b>Information</b>					
Time	1. s				
Load Step	1				
Substep	1				
Iteration Number	1				

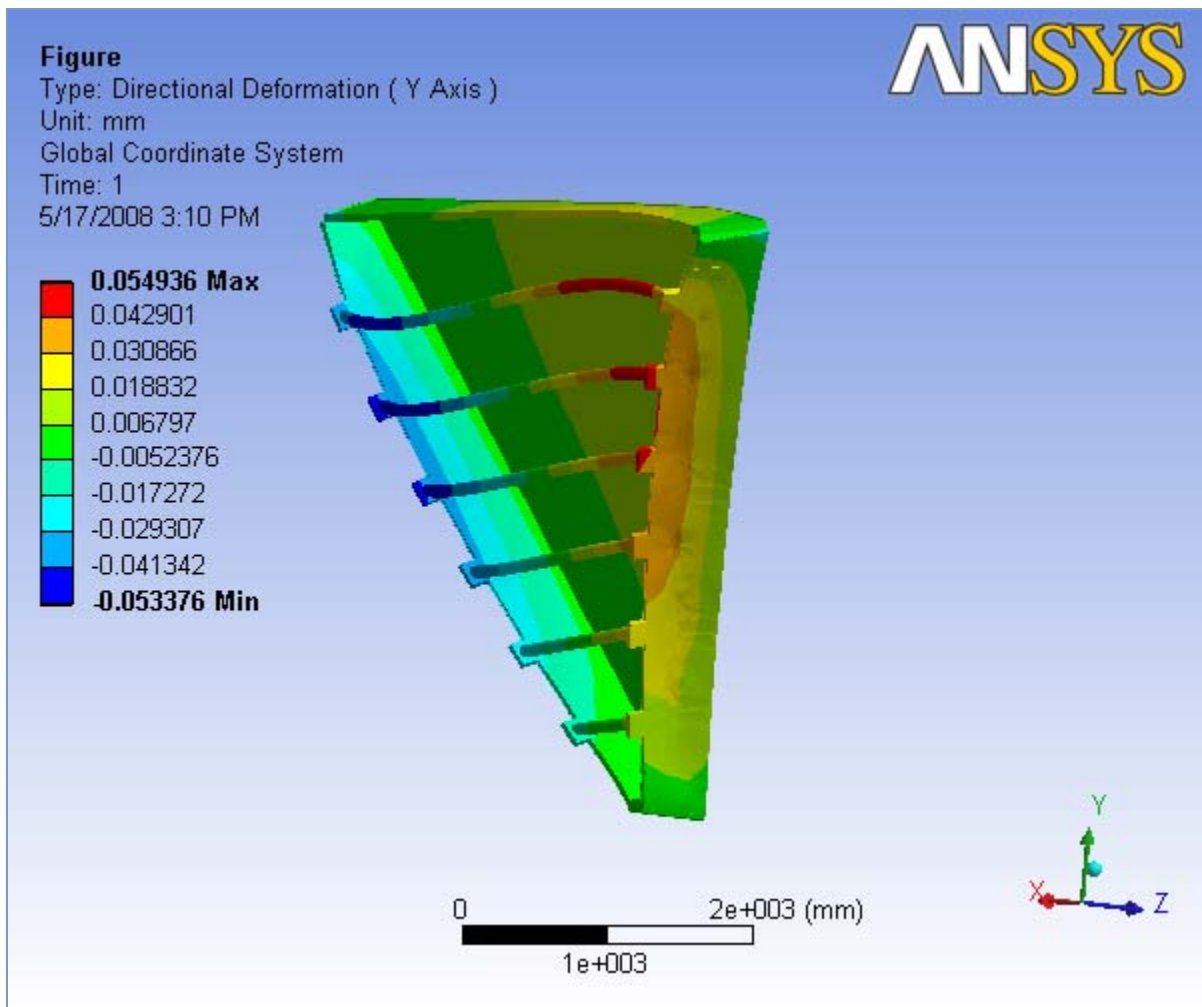
**FIGURE 10**  
Sector 1 > Static Structural > Solution > Total Deformation > Figure



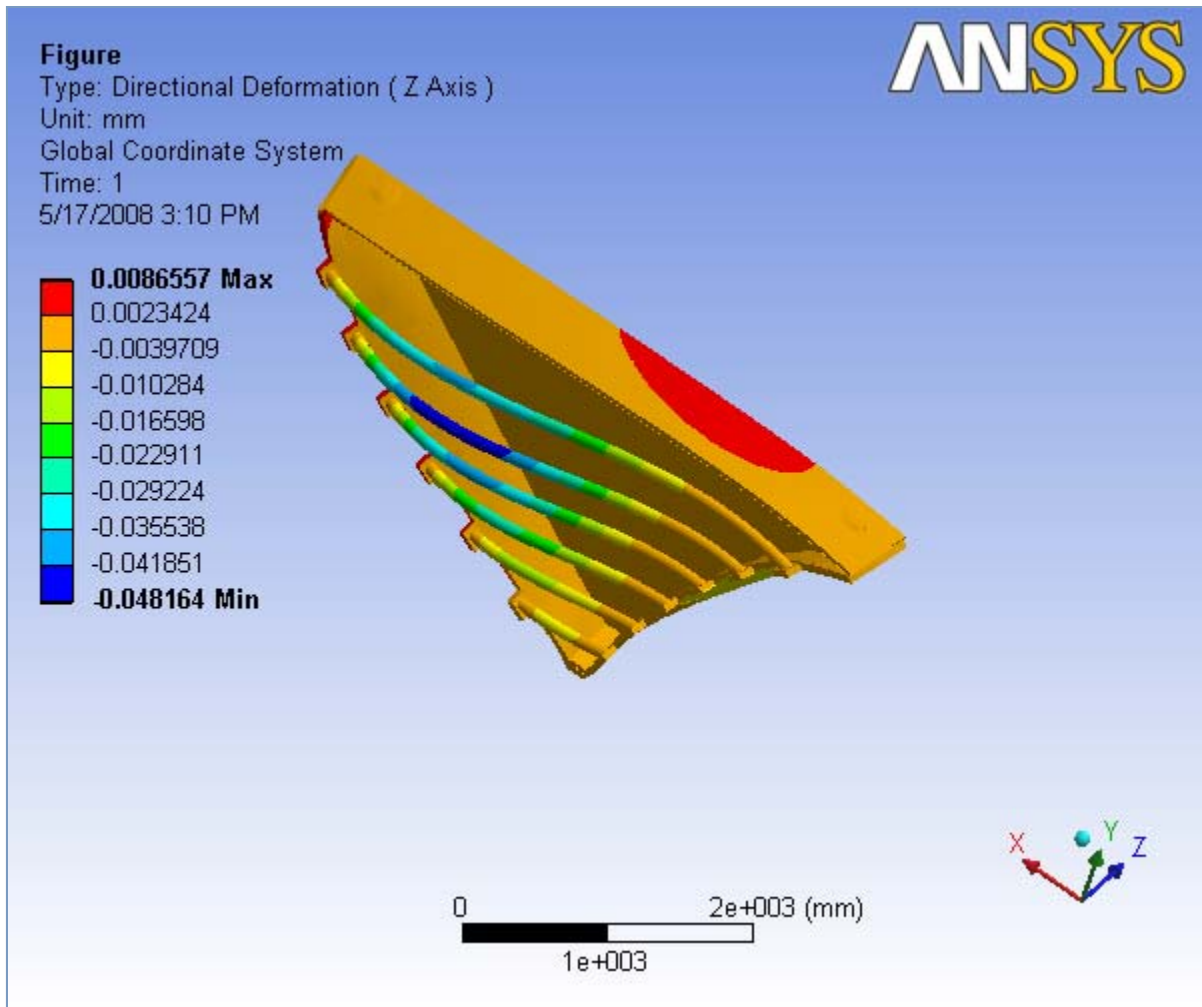
**FIGURE 11**  
Sector 1 > Static Structural > Solution > X - Directional Deformation > Figure



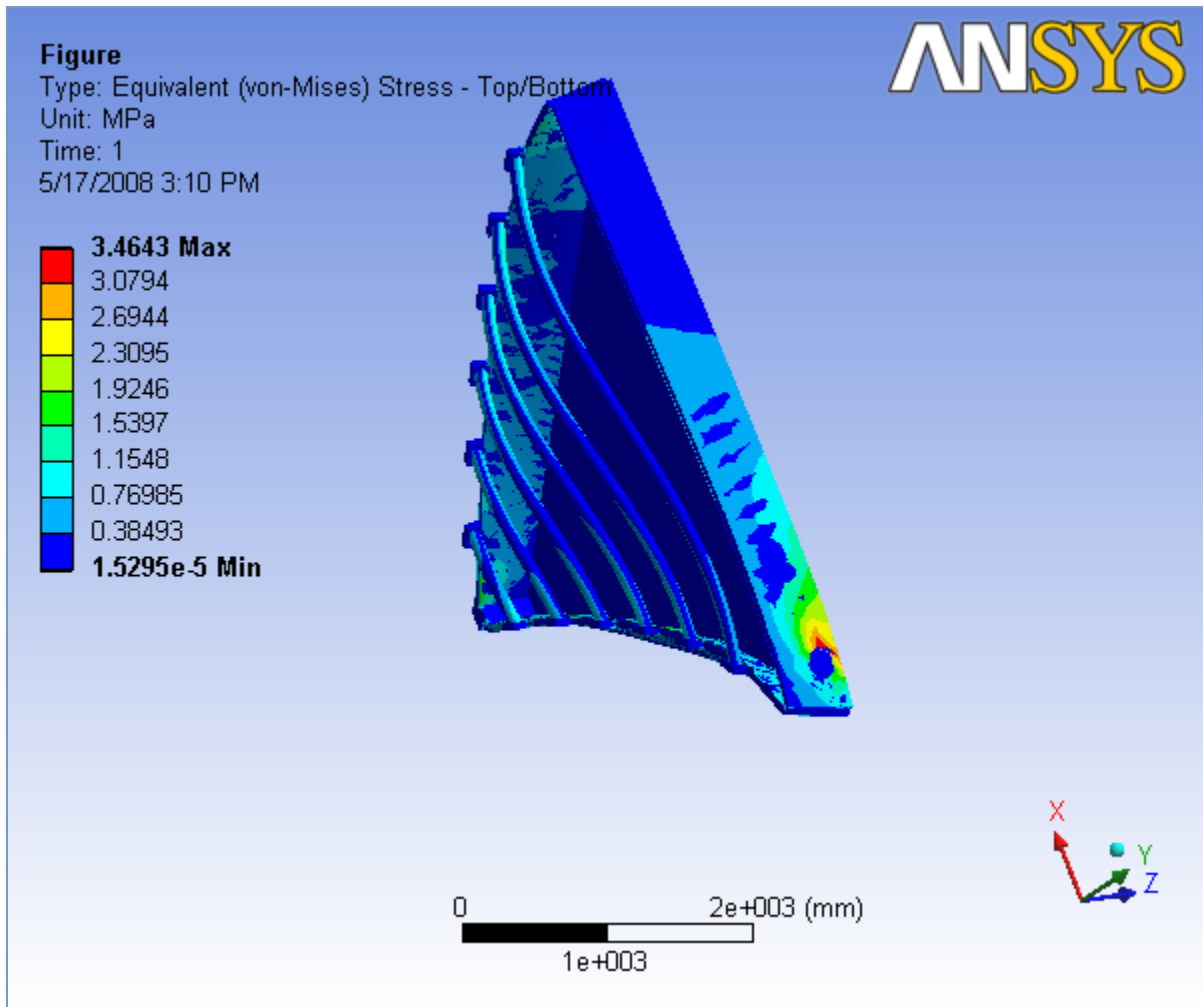
**FIGURE 12**  
Sector 1 > Static Structural > Solution > Y - Directional Deformation > Figure



**FIGURE 13**  
**Sector 1 > Static Structural > Solution > Z - Directional Deformation > Figure**



**FIGURE 14**  
Sector 1 > Static Structural > Solution > Equivalent Stress > Figure

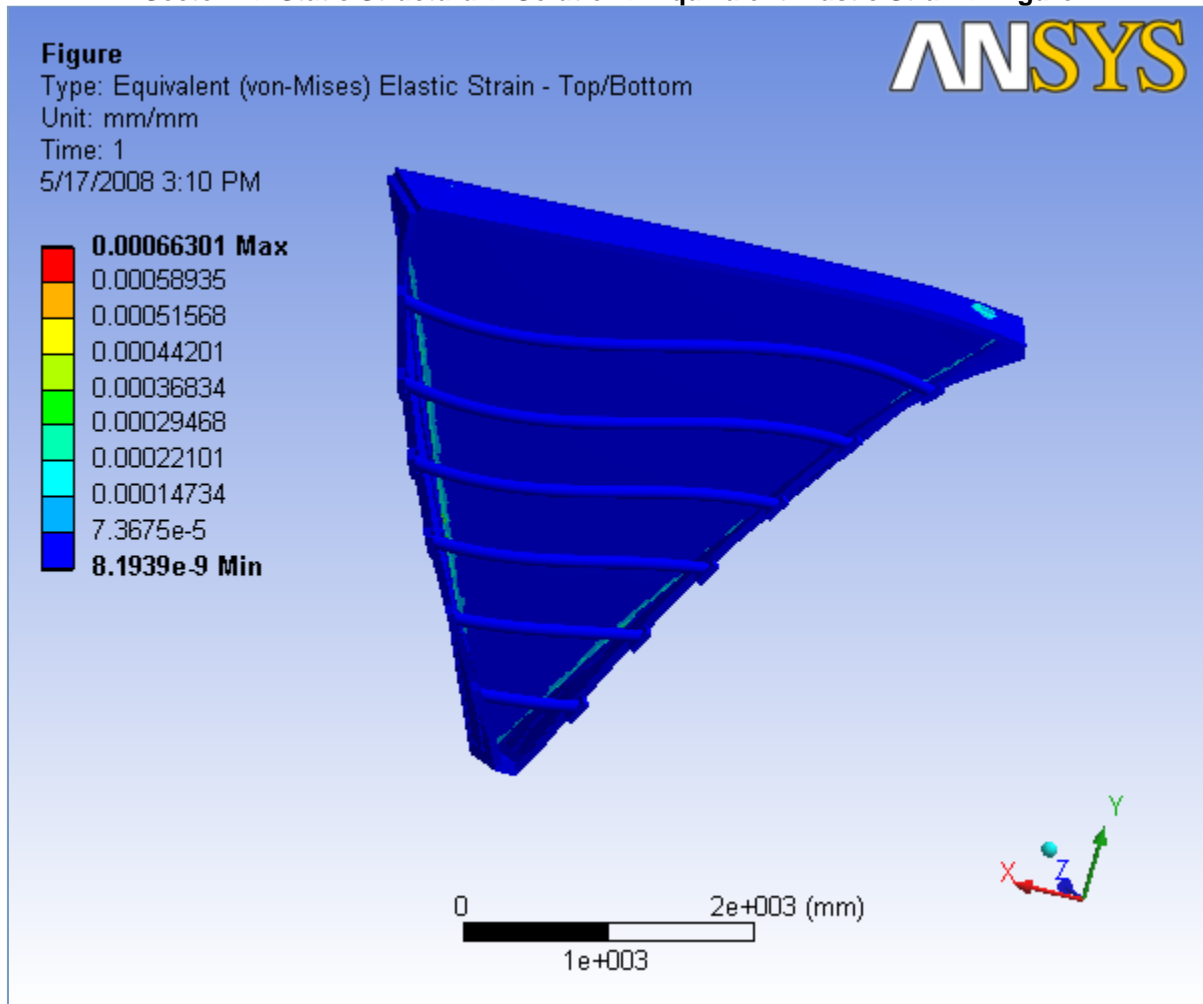


**TABLE 35**  
**Sector 1 > Static Structural > Solution > Results**

Object Name	Equivalent Elastic Strain
State	Solved
<b>Scope</b>	
Geometry	All Bodies
<b>Definition</b>	
Type	Equivalent (von-Mises) Elastic Strain
Shell	Top/Bottom
Display Time	End Time
<b>Results</b>	
Minimum	8.1939e-009 mm/mm
Maximum	6.6301e-004 mm/mm
Minimum Occurs On	Rod 1
Maximum Occurs On	Hexcel
<b>Information</b>	
Time	1. s
Load Step	1
Substep	1
Iteration Number	1

**FIGURE 15**

## Sector 1 &gt; Static Structural &gt; Solution &gt; Equivalent Elastic Strain &gt; Figure



## Material Data

### Aluminum

**TABLE 36**  
**Aluminum > Constants**

<b>Structural</b>	
Young's Modulus	68900 MPa
Poisson's Ratio	0.33
Density	2.7e-006 kg/mm <sup>3</sup>
Thermal Expansion	2.3e-005 1/°C
<b>Thermal</b>	
Thermal Conductivity	0. W/mm·°C
Specific Heat	0. J/kg·°C
<b>Electromagnetics</b>	
Relative Permeability	0.
Resistivity	0. Ohm-mm

### Polyurethane

**TABLE 37**  
**Polyurethane > Constants**

<b>Structural</b>	
Young's Modulus	66. MPa
Poisson's Ratio	0.3
Density	2.4e-007 kg/mm <sup>3</sup>
Thermal Expansion	6.12e-005 1/°C
<b>Thermal</b>	
Thermal Conductivity	0. W/mm·°C
Specific Heat	0. J/kg·°C
<b>Electromagnetics</b>	
Relative Permeability	0.
Resistivity	0. Ohm·mm

### *Stainless steel*

**TABLE 38**  
**Stainless steel > Constants**

<b>Structural</b>	
Young's Modulus	1.93e+005 MPa
Poisson's Ratio	0.3
Density	8.e-006 kg/mm <sup>3</sup>
Thermal Expansion	0. 1/°C
<b>Thermal</b>	
Thermal Conductivity	0. W/mm·°C
Specific Heat	0. J/kg·°C
<b>Electromagnetics</b>	
Relative Permeability	0.
Resistivity	0. Ohm·mm

### *Carbon fiber*

**TABLE 39**  
**Carbon fiber > Constants**

<b>Structural</b>	
Young's Modulus	1.5e+005 MPa
Poisson's Ratio	0.3
Density	5.8e-007 kg/mm <sup>3</sup>
Thermal Expansion	0. 1/°C
<b>Thermal</b>	
Thermal Conductivity	0. W/mm·°C
Specific Heat	0. J/kg·°C
<b>Electromagnetics</b>	
Relative Permeability	0.
Resistivity	0. Ohm·mm

### *Hexcel*

**TABLE 40**  
**Hexcel > Constants**

<b>Structural</b>	



Young's Modulus	30. MPa
Poisson's Ratio	0.33
Density	2.883e-008 kg/mm <sup>3</sup>
Thermal Expansion	0. 1/°C
<b>Thermal</b>	
Thermal Conductivity	0. W/mm·°C
Specific Heat	0. J/kg·°C
<b>Electromagnetics</b>	
Relative Permeability	0.
Resistivity	0. Ohm·mm