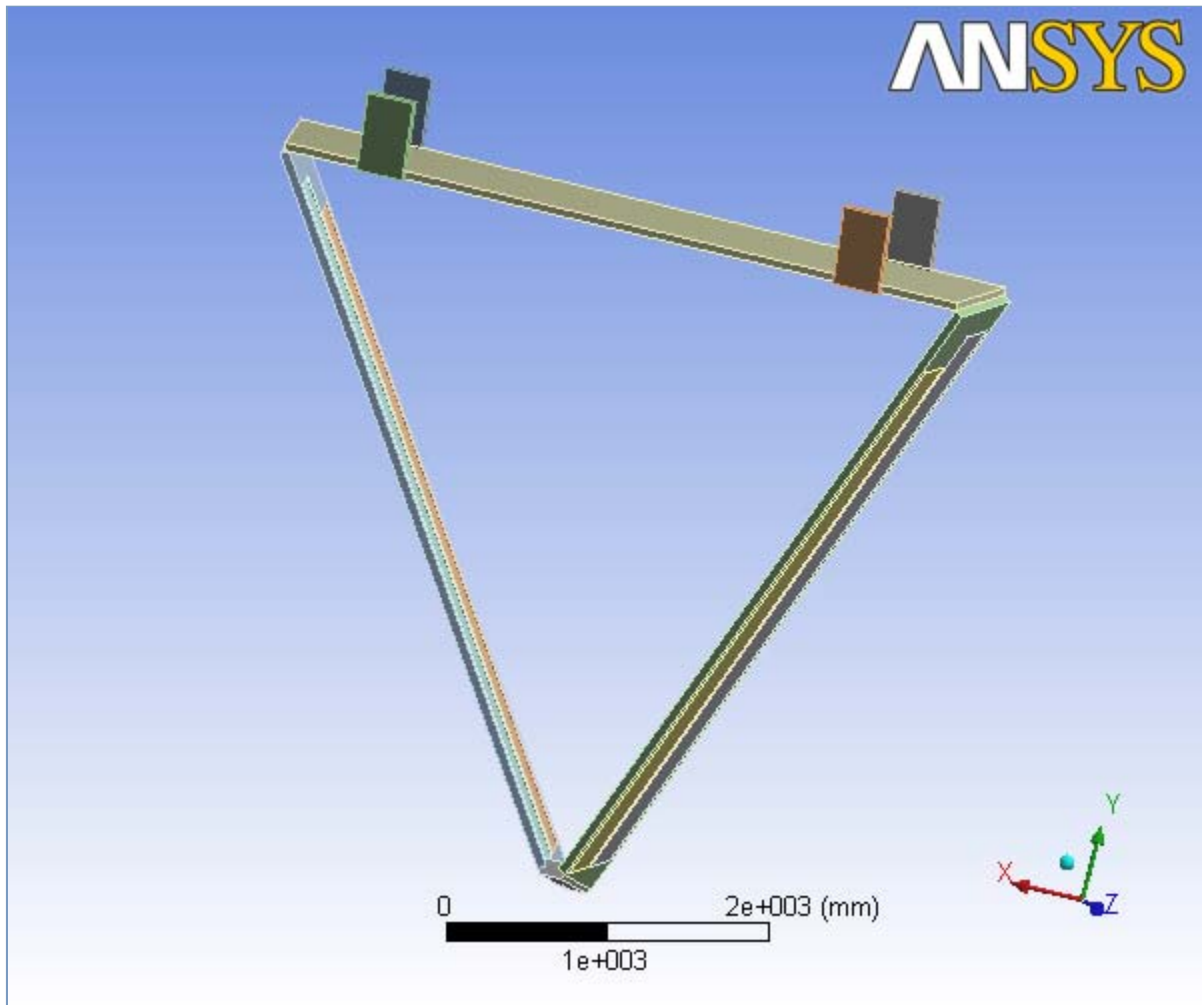




DRIFT CHAMBER R3 PRIMARY ANALYSIS

| | |
|------------------------|------------------------------------|
| <i>Author</i> | <i>Kalyan Jinnuri</i> |
| <i>First Saved</i> | <i>Wednesday, January 23, 2008</i> |
| <i>Last Saved</i> | <i>Wednesday, January 23, 2008</i> |
| <i>Product Version</i> | <i>11.0 Release</i> |



Contents

- **Analysis 2.2**
 - [Geometry](#)
 - [Parts](#)
 - [Connections](#)
 - [Contact Regions](#)
 - [Mesh](#)
 - **Static Structural**
 - [Analysis Settings](#)
 - [Acceleration](#)
 - [Loads](#)
 - [Solution](#)
 - [Solution Information](#)
 - [Results](#)
- **Material Data**
 - [Polyurethane](#)
 - [Carbon Fiber](#)

Units

TABLE 1

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

Analysis 2.2

Geometry

TABLE 2
Analysis 2.2 > Geometry

| | |
|---------------------|---|
| Object Name | <i>Geometry</i> |
| State | Fully Defined |
| Definition | |
| Source | C:\Documents and Settings\Jinnuri\Desktop\website\full2\ful2.agdb |
| Type | DesignModeler |
| Length Unit | Millimeters |
| Element Control | Program Controlled |
| Display Style | Part Color |
| Bounding Box | |
| Length X | 4770.1 mm |
| Length Y | 4526.2 mm |
| Length Z | 2869.2 mm |
| Properties | |
| Volume | 4.8602e+008 mm ³ |
| Mass | 116.64 kg |
| Statistics | |
| Bodies | 31 |

| | |
|-----------------------------------|------|
| Active Bodies | 13 |
| Nodes | 5398 |
| Elements | 759 |
| Preferences | |
| 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
Analysis 2.2 > Geometry > Parts

| Object Name | <i>Nose</i> | <i>End plate 1</i> | <i>End Plate 2</i> | <i>hole area big 1</i> | <i>hole area small 1</i> |
|----------------------------|-----------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| State | Meshed | | | | |
| Graphics Properties | | | | | |
| Visible | Yes | | | | |
| Transparency | 1 | | | | |
| Definition | | | | | |
| Suppressed | No | | | | |
| Material | Polyurethane | | | | |
| Stiffness Behavior | Flexible | | | | |
| Nonlinear Material Effects | Yes | | | | |
| Bounding Box | | | | | |
| Length X | 180.6 mm | 2344.4 mm | 2046.5 mm | 2159.8 mm | |
| Length Y | 102.32 mm | 4003.3 mm | 3487.3 mm | 3683.7 mm | |
| Length Z | 614. mm | 2637. mm | 2017.5 mm | 2122.9 mm | |
| Properties | | | | | |
| Volume | 8.1265e+006 mm ³ | 4.6506e+007 mm ³ | | 5.5389e+007 mm ³ | 5.861e+007 mm ³ |
| Mass | 1.9504 kg | 11.161 kg | | 13.293 kg | 14.066 kg |
| Centroid X | 3.0561e-015 mm | 1319.1 mm | -1312.8 mm | 1128.1 mm | 1129.1 mm |
| Centroid Y | 46.196 mm | 2216. mm | 2205. mm | 1885.1 mm | 1886.8 mm |
| Centroid Z | 305.18 mm | -833.18 mm | -860.56 mm | -529. mm | -821.16 mm |
| Moment of Inertia Ip1 | 62316 kg·mm ² | 3.2267e+007 kg·mm ² | 3.2302e+007 kg·mm ² | 2.0539e+007 kg·mm ² | 2.4327e+007 kg·mm ² |
| Moment of Inertia Ip2 | 63775 kg·mm ² | 4.4553e+005 kg·mm ² | 4.7654e+005 kg·mm ² | 59712 kg·mm ² | 63184 kg·mm ² |

| | | | | | |
|-----------------------|---------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| Moment of Inertia Ip3 | 4948.6 kg·mm ² | 3.1827e+007 kg·mm ² | 3.1832e+007 kg·mm ² | 2.0487e+007 kg·mm ² | 2.4271e+007 kg·mm ² |
| Statistics | | | | | |
| Nodes | 379 | 1225 | 1230 | 200 | |
| Elements | 151 | 109 | | 16 | |

TABLE 4
Analysis 2.2 > Geometry > Parts

| | | | | | |
|----------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------|-----------------------|
| Object Name | <i>hole area short 2</i> | <i>hole area long 2</i> | <i>back plate</i> | <i>slider hinge 1</i> | <i>slider hinge 2</i> |
| State | Meshed | | | | |
| Graphics Properties | | | | | |
| Visible | Yes | | | | |
| Transparency | 1 | | | | |
| Definition | | | | | |
| Suppressed | No | | | | |
| Material | Polyurethane | | | | |
| Stiffness Behavior | Flexible | | | | |
| Nonlinear Material Effects | Yes | | | | |
| Bounding Box | | | | | |
| Length X | 2046.5 mm | 2159.8 mm | 4680.1 mm | 300. mm | |
| Length Y | 3487.3 mm | 3683.7 mm | 253.81 mm | 482.47 mm | |
| Length Z | 2017.5 mm | 2122.9 mm | 533.65 mm | 233.19 mm | |
| Properties | | | | | |
| Volume | 5.5389e+007 mm ³ | 5.861e+007 mm ³ | 1.2688e+008 mm ³ | 7.5e+006 mm ³ | |
| Mass | 13.293 kg | 14.066 kg | 30.452 kg | 1.8 kg | |
| Centroid X | -1074.5 mm | -1184.7 mm | 9.6892 mm | -1685.5 mm | 1694.7 mm |
| Centroid Y | 1792.3 mm | 1983.3 mm | 3954. mm | 4274.9 mm | |
| Centroid Z | -759.38 mm | -581.71 mm | -1771.8 mm | -1577.3 mm | |
| Moment of Inertia Ip1 | 2.0539e+007 kg·mm ² | 2.4327e+007 kg·mm ² | 7.8835e+005 kg·mm ² | 37875 kg·mm ² | |
| Moment of Inertia Ip2 | 59712 kg·mm ² | 63184 kg·mm ² | 5.3832e+007 kg·mm ² | 13875 kg·mm ² | |
| Moment of Inertia Ip3 | 2.0487e+007 kg·mm ² | 2.4271e+007 kg·mm ² | 5.3056e+007 kg·mm ² | 51000 kg·mm ² | |
| Statistics | | | | | |
| Nodes | 200 | | 336 | 254 | |
| Elements | 16 | | 34 | 28 | |

TABLE 5
Analysis 2.2 > Geometry > Parts

| | | | | | |
|----------------------------|-----------------------|-----------------------|------------------------|---------------------|---------------------|
| Object Name | <i>slider hinge 3</i> | <i>slider hinge 4</i> | <i>ball joint area</i> | <i>carbon rod 1</i> | <i>carbon rod 2</i> |
| State | Meshed | | | Suppressed | |
| Graphics Properties | | | | | |
| Visible | Yes | | | No | |
| Transparency | 1 | | | | |
| Definition | | | | | |
| Suppressed | No | | | Yes | |
| Material | Polyurethane | | | Carbon Fiber | |
| Stiffness Behavior | Flexible | | | | |

| | | | | |
|----------------------------|--------------------------|--------------------------------|-----------------------------|-----------------------------|
| Nonlinear Material Effects | Yes | | | |
| Bounding Box | | | | |
| Length X | 300. mm | 10. mm | 679.59 mm | 1370.8 mm |
| Length Y | 482.47 mm | 10. mm | 41.264 mm | 48. mm |
| Length Z | 233.19 mm | 10. mm | 48. mm | |
| Properties | | | | |
| Volume | 7.5e+006 mm ³ | 272.69 mm ³ | 1.9112e+005 mm ³ | 2.5612e+005 mm ³ |
| Mass | 1.8 kg | 6.5446e-005 kg | 0.11085 kg | 0.14855 kg |
| Centroid X | 1595.7 mm -1565.9 mm | 0.25 mm | -9.8728e-004 mm | -1.1733e-009 mm |
| Centroid Y | 4048.8 mm | -2.6037 mm | 566.58 mm | 1151.8 mm |
| Centroid Z | -2138.6 mm | 307. mm | -258.97 mm | -586.06 mm |
| Moment of Inertia Ip1 | 37875 kg·mm ² | 4.9643e-004 kg·mm ² | 29.672 kg·mm ² | 79.172 kg·mm ² |
| Moment of Inertia Ip2 | 13875 kg·mm ² | 4.809e-004 kg·mm ² | 4103.3 kg·mm ² | 22124 kg·mm ² |
| Moment of Inertia Ip3 | 51000 kg·mm ² | 4.9643e-004 kg·mm ² | 4084.8 kg·mm ² | 22124 kg·mm ² |
| Statistics | | | | |
| Nodes | 254 | 412 | 0 | |
| Elements | 28 | 180 | 0 | |

TABLE 6
Analysis 2.2 > Geometry > Parts

| | | | | | |
|----------------------------|-----------------------------|--------------------------------|--------------------------------|--------------------------------|-----------------------------|
| Object Name | <i>carbon rod 3</i> | <i>carbon rod 4</i> | <i>carbon rod 5</i> | <i>carbon rod 6</i> | <i>Solid</i> |
| State | Suppressed | | | | |
| Graphics Properties | | | | | |
| Visible | No | | | | |
| Definition | | | | | |
| Suppressed | Yes | | | | |
| Material | Carbon Fiber | | | | |
| Stiffness Behavior | Flexible | | | | |
| Nonlinear Material Effects | Yes | | | | |
| Bounding Box | | | | | |
| Length X | 1937.5 mm | 2470.4 mm | 3082.6 mm | 3760.9 mm | 336.97 mm |
| Length Y | 48. mm | 47.509 mm | 48. mm | | 43.109 mm |
| Length Z | 48. mm | 46.695 mm | 48. mm | | 45.236 mm |
| Properties | | | | | |
| Volume | 3.6419e+005 mm ³ | 6.0063e+005 mm ³ | 5.8256e+005 mm ³ | 7.1191e+005 mm ³ | 4.9426e+005 mm ³ |
| Mass | 0.21123 kg | 0.34836 kg | 0.33789 kg | 0.41291 kg | 0.28667 kg |
| Centroid X | -7.9857e-010 mm | 8.7038e-002 mm | -2.7438e-010 mm | 3.3584e-008 mm | 162.27 mm |
| Centroid Y | 1642.5 mm | 2113.4 mm | 2634.2 mm | 3221.6 mm | 550.71 mm |
| Centroid Z | -838.2 mm | -1074.2 mm | -1367.3 mm | -1684.9 mm | -252.64 mm |
| Moment of Inertia Ip1 | 112.58 kg·mm ² | 101.09 kg·mm ² | 180.1 kg·mm ² | 220.08 kg·mm ² | 67.791 kg·mm ² |
| Moment of Inertia Ip2 | 63528 kg·mm ² | 1.7325e+005 kg·mm ² | 2.5985e+005 kg·mm ² | 4.7413e+005 kg·mm ² | 2525.2 kg·mm ² |
| Moment of Inertia Ip3 | 63528 kg·mm ² | 1.7331e+005 kg·mm ² | 2.5985e+005 kg·mm ² | 4.7413e+005 kg·mm ² | 2521. kg·mm ² |

| Statistics | |
|------------|---|
| Nodes | 0 |
| Elements | 0 |

TABLE 7
Analysis 2.2 > Geometry > Parts

| Object Name | <i>Solid</i> | <i>Solid</i> | <i>Solid</i> | <i>Solid</i> | <i>Solid</i> |
|----------------------------|----------------------------|-----------------------------|--------------------------------|--------------------------------|--------------------------------|
| State | Suppressed | | | | |
| Graphics Properties | | | | | |
| Visible | No | | | | |
| Definition | | | | | |
| Suppressed | Yes | | | | |
| Material | Carbon Fiber | | | | |
| Stiffness Behavior | Flexible | | | | |
| Nonlinear Material Effects | Yes | | | | |
| Bounding Box | | | | | |
| Length X | 684.64 mm | 967.98 mm | 1233.4 mm | 1540.5 mm | 1879.7 mm |
| Length Y | 45.4 mm | | 44.781 mm | 45.4 mm | |
| Length Z | 45.4 mm | | 44.516 mm | 45.4 mm | |
| Properties | | | | | |
| Volume | 1.087e+006 mm ³ | 1.5457e+006 mm ³ | 1.9096e+006 mm ³ | 2.4725e+006 mm ³ | 3.0215e+006 mm ³ |
| Mass | 0.63048 kg | 0.89649 kg | 1.1076 kg | 1.4341 kg | 1.7525 kg |
| Centroid X | 335.77 mm | 477.43 mm | 610.06 mm | 763.68 mm | 933.25 mm |
| Centroid Y | 1151.7 mm | 1642.4 mm | 2102.5 mm | 2634.1 mm | 3221.5 mm |
| Centroid Z | -586.07 mm | -838.21 mm | -1086.5 mm | -1367.3 mm | -1684.9 mm |
| Moment of Inertia Ip1 | 158.43 kg·mm ² | 225.31 kg·mm ² | 269.69 kg·mm ² | 360.43 kg·mm ² | 440.47 kg·mm ² |
| Moment of Inertia Ip2 | 23501 kg·mm ² | 67430 kg·mm ² | 1.3607e+005 kg·mm ² | 2.7568e+005 kg·mm ² | 5.0297e+005 kg·mm ² |
| Moment of Inertia Ip3 | 23501 kg·mm ² | 67431 kg·mm ² | 1.3608e+005 kg·mm ² | 2.7568e+005 kg·mm ² | 5.0297e+005 kg·mm ² |
| Statistics | | | | | |
| Nodes | 0 | | | | |
| Elements | 0 | | | | |

TABLE 8
Analysis 2.2 > Geometry > Parts

| Object Name | <i>Solid</i> | <i>Solid</i> | <i>Solid</i> | <i>Solid</i> | <i>Solid</i> |
|----------------------------|--------------|--------------|--------------|--------------|--------------|
| State | Suppressed | | | | |
| Graphics Properties | | | | | |
| Visible | No | | | | |
| Definition | | | | | |
| Suppressed | Yes | | | | |
| Material | Carbon Fiber | | | | |
| Stiffness Behavior | Flexible | | | | |
| Nonlinear Material Effects | Yes | | | | |
| Bounding Box | | | | | |
| Length X | 336.97 mm | 684.64 mm | 967.98 mm | 1233.4 mm | 1540.5 mm |
| Length Y | 43.109 mm | 45.4 mm | | 44.781 mm | 45.4 mm |

| | | | | | |
|-----------------------|-----------------------------|----------------------------|-----------------------------|--------------------------------|--------------------------------|
| Length Z | 45.236 mm | 45.4 mm | | 44.516 mm | 45.4 mm |
| Properties | | | | | |
| Volume | 4.9426e+005 mm ³ | 1.087e+006 mm ³ | 1.5457e+006 mm ³ | 1.9096e+006 mm ³ | 2.4725e+006 mm ³ |
| Mass | 0.28667 kg | 0.63048 kg | 0.89649 kg | 1.1076 kg | 1.4341 kg |
| Centroid X | -162.27 mm | -335.77 mm | -477.43 mm | -610.06 mm | -763.68 mm |
| Centroid Y | 550.71 mm | 1151.7 mm | 1642.4 mm | 2102.5 mm | 2634.1 mm |
| Centroid Z | -252.62 mm | -586.05 mm | -838.19 mm | -1086.5 mm | -1367.3 mm |
| Moment of Inertia Ip1 | 67.88 kg·mm ² | 158.43 kg·mm ² | 225.31 kg·mm ² | 269.74 kg·mm ² | 360.43 kg·mm ² |
| Moment of Inertia Ip2 | 2526.4 kg·mm ² | 23501 kg·mm ² | 67430 kg·mm ² | 1.3608e+005 kg·mm ² | 2.7568e+005 kg·mm ² |
| Moment of Inertia Ip3 | 2522.3 kg·mm ² | 23501 kg·mm ² | 67431 kg·mm ² | 1.3609e+005 kg·mm ² | 2.7568e+005 kg·mm ² |
| Statistics | | | | | |
| Nodes | 0 | | | | |
| Elements | 0 | | | | |

TABLE 9
Analysis 2.2 > Geometry > Parts

| | |
|----------------------------|--------------------------------|
| Object Name | <i>Solid</i> |
| State | Suppressed |
| Graphics Properties | |
| Visible | No |
| Definition | |
| Suppressed | Yes |
| Material | Carbon Fiber |
| Stiffness Behavior | Flexible |
| Nonlinear Material Effects | Yes |
| Bounding Box | |
| Length X | 1879.7 mm |
| Length Y | 45.4 mm |
| Length Z | 45.4 mm |
| Properties | |
| Volume | 3.0215e+006 mm ³ |
| Mass | 1.7525 kg |
| Centroid X | -933.25 mm |
| Centroid Y | 3221.5 mm |
| Centroid Z | -1684.9 mm |
| Moment of Inertia Ip1 | 440.47 kg·mm ² |
| Moment of Inertia Ip2 | 5.0297e+005 kg·mm ² |
| Moment of Inertia Ip3 | 5.0297e+005 kg·mm ² |
| Statistics | |
| Nodes | 0 |
| Elements | 0 |

Connections

TABLE 10
Analysis 2.2 > Connections

| | |
|-------------|--------------------|
| Object Name | <i>Connections</i> |
|-------------|--------------------|

| | |
|----------------------------|---------------|
| State | Fully Defined |
| Auto Detection | |
| Generate Contact On Update | Yes |
| Tolerance Type | Slider |
| Tolerance Slider | 0. |
| Tolerance Value | 17.936 mm |
| Face/Face | Yes |
| Face/Edge | No |
| Edge/Edge | No |
| Priority | Include All |
| Same Body Grouping | Yes |
| Revolute Joints | Yes |
| Fixed Joints | Yes |
| Transparency | |
| Enabled | Yes |

TABLE 11
Analysis 2.2 > Connections > Contact Regions

| Object Name | Contact Region | Contact Region 2 | Contact Region 3 | Contact Region 4 | Contact Region 5 |
|---------------------|--------------------|------------------|-------------------|-------------------|------------------|
| State | Fully Defined | | | | |
| Scope | | | | | |
| Scoping Method | Geometry Selection | | | | |
| Contact | 2 Faces | | 1 Face | | |
| Target | 2 Faces | | 1 Face | | |
| Contact Bodies | Nose | | | | |
| Target Bodies | End plate 1 | End Plate 2 | hole area small 1 | hole area short 2 | ball joint area |
| Definition | | | | | |
| Type | Bonded | | | | |
| Scope Mode | Automatic | | | | |
| Behavior | Symmetric | | | | |
| Suppressed | No | | | | |
| Advanced | | | | | |
| Formulation | Pure Penalty | | | | |
| Normal Stiffness | Program Controlled | | | | |
| Update Stiffness | Never | | | | |
| Thermal Conductance | Program Controlled | | | | |
| Pinball Region | Program Controlled | | | | |

TABLE 12
Analysis 2.2 > Connections > Contact Regions

| Object Name | Contact Region 6 | Contact Region 7 | Contact Region 8 | Contact Region 9 | Contact Region 10 |
|----------------|--------------------|------------------|------------------|------------------|-------------------|
| State | Fully Defined | | | Suppressed | |
| Scope | | | | | |
| Scoping Method | Geometry Selection | | | | |
| Contact | 4 Faces | | 3 Faces | 1 Face | 3 Faces |
| Target | 4 Faces | | No Selection | | |
| Contact Bodies | End plate 1 | | | | |
| Target Bodies | hole area big 1 | hole area small | carbon rod 1 | carbon rod 2 | carbon rod 3 |

| | |
|---------------------|--------------------|
| | 1 |
| Definition | |
| Type | Bonded |
| Scope Mode | Automatic |
| Behavior | Symmetric |
| Suppressed | No |
| Advanced | |
| Formulation | Pure Penalty |
| Normal Stiffness | Program Controlled |
| Update Stiffness | Never |
| Thermal Conductance | Program Controlled |
| Pinball Region | Program Controlled |

TABLE 13
Analysis 2.2 > Connections > Contact Regions

| Object Name | Contact Region 11 | Contact Region 12 | Contact Region 13 | Contact Region 14 | Contact Region 15 |
|---------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| State | Suppressed | | | | |
| Scope | | | | | |
| Scoping Method | Geometry Selection | | | | |
| Contact | 2 Faces | 3 Faces | | 1 Face | |
| Target | No Selection | | | | |
| Contact Bodies | End plate 1 | | | | |
| Target Bodies | carbon rod 4 | carbon rod 5 | carbon rod 6 | Solid | |
| Definition | | | | | |
| Type | Bonded | | | | |
| Scope Mode | Automatic | | | | |
| Behavior | Symmetric | | | | |
| Suppressed | No | | | | |
| Advanced | | | | | |
| Formulation | Pure Penalty | | | | |
| Normal Stiffness | Program Controlled | | | | |
| Update Stiffness | Never | | | | |
| Thermal Conductance | Program Controlled | | | | |
| Pinball Region | Program Controlled | | | | |

TABLE 14
Analysis 2.2 > Connections > Contact Regions

| Object Name | Contact Region 16 | Contact Region 17 | Contact Region 18 | Contact Region 19 | Contact Region 20 |
|-------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| State | Suppressed | | | | Fully Defined |
| Scope | | | | | |
| Scoping Method | Geometry Selection | | | | |
| Contact | 1 Face | | | 4 Faces | |
| Target | No Selection | | | 4 Faces | |
| Contact Bodies | End plate 1 | | | End Plate 2 | |
| Target Bodies | Solid | | | hole area short 2 | |
| Definition | | | | | |
| Type | Bonded | | | | |

| | |
|---------------------|--------------------|
| Scope Mode | Automatic |
| Behavior | Symmetric |
| Suppressed | No |
| Advanced | |
| Formulation | Pure Penalty |
| Normal Stiffness | Program Controlled |
| Update Stiffness | Never |
| Thermal Conductance | Program Controlled |
| Pinball Region | Program Controlled |

TABLE 15
Analysis 2.2 > Connections > Contact Regions

| Object Name | Contact Region 21 | Contact Region 22 | Contact Region 23 | Contact Region 24 | Contact Region 25 |
|---------------------|--------------------|-------------------|-------------------|-------------------|-------------------|
| State | Fully Defined | Suppressed | | | |
| Scope | | | | | |
| Scoping Method | Geometry Selection | | | | |
| Contact | 4 Faces | 2 Faces | 1 Face | 2 Faces | 1 Face |
| Target | 4 Faces | No Selection | | | |
| Contact Bodies | End Plate 2 | | | | |
| Target Bodies | hole area long 2 | carbon rod 1 | carbon rod 2 | carbon rod 3 | carbon rod 4 |
| Definition | | | | | |
| Type | Bonded | | | | |
| Scope Mode | Automatic | | | | |
| Behavior | Symmetric | | | | |
| Suppressed | No | | | | |
| Advanced | | | | | |
| Formulation | Pure Penalty | | | | |
| Normal Stiffness | Program Controlled | | | | |
| Update Stiffness | Never | | | | |
| Thermal Conductance | Program Controlled | | | | |
| Pinball Region | Program Controlled | | | | |

TABLE 16
Analysis 2.2 > Connections > Contact Regions

| Object Name | Contact Region 26 | Contact Region 27 | Contact Region 28 | Contact Region 29 | Contact Region 30 |
|-------------------|--------------------|-------------------|-------------------|-------------------|-------------------|
| State | Suppressed | | | | |
| Scope | | | | | |
| Scoping Method | Geometry Selection | | | | |
| Contact | 2 Faces | | 1 Face | | |
| Target | No Selection | | | | |
| Contact Bodies | End Plate 2 | | | | |
| Target Bodies | carbon rod 5 | carbon rod 6 | Solid | | |
| Definition | | | | | |
| Type | Bonded | | | | |
| Scope Mode | Automatic | | | | |
| Behavior | Symmetric | | | | |
| Suppressed | No | | | | |

| Advanced | |
|---------------------|--------------------|
| Formulation | Pure Penalty |
| Normal Stiffness | Program Controlled |
| Update Stiffness | Never |
| Thermal Conductance | Program Controlled |
| Pinball Region | Program Controlled |

TABLE 17
Analysis 2.2 > Connections > Contact Regions

| Object Name | <i>Contact Region</i> 31 | <i>Contact Region</i> 32 | <i>Contact Region</i> 33 | <i>Contact Region</i> 34 | <i>Contact Region</i> 35 |
|---------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| State | Suppressed | | | | |
| Scope | | | | | |
| Scoping Method | Geometry Selection | | | | |
| Contact | 1 Face | | | | |
| Target | No Selection | | | | |
| Contact Bodies | End Plate 2 | | | hole area small 1 | |
| Target Bodies | Solid | | | carbon rod 1 | carbon rod 2 |
| Definition | | | | | |
| Type | Bonded | | | | |
| Scope Mode | Automatic | | | | |
| Behavior | Symmetric | | | | |
| Suppressed | No | | | | |
| Advanced | | | | | |
| Formulation | Pure Penalty | | | | |
| Normal Stiffness | Program Controlled | | | | |
| Update Stiffness | Never | | | | |
| Thermal Conductance | Program Controlled | | | | |
| Pinball Region | Program Controlled | | | | |

TABLE 18
Analysis 2.2 > Connections > Contact Regions

| Object Name | <i>Contact Region</i> 36 | <i>Contact Region</i> 37 | <i>Contact Region</i> 38 | <i>Contact Region</i> 39 | <i>Contact Region</i> 40 |
|-------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| State | Suppressed | | | | |
| Scope | | | | | |
| Scoping Method | Geometry Selection | | | | |
| Contact | 1 Face | | | | |
| Target | No Selection | | | | |
| Contact Bodies | hole area small 1 | | | | |
| Target Bodies | carbon rod 3 | carbon rod 4 | carbon rod 5 | carbon rod 6 | Solid |
| Definition | | | | | |
| Type | Bonded | | | | |
| Scope Mode | Automatic | | | | |
| Behavior | Symmetric | | | | |
| Suppressed | No | | | | |
| Advanced | | | | | |
| Formulation | Pure Penalty | | | | |
| Normal Stiffness | Program Controlled | | | | |
| | | | | | |

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

TABLE 19
Analysis 2.2 > Connections > Contact Regions

| Object Name | Contact Region 41 | Contact Region 42 | Contact Region 43 | Contact Region 44 | Contact Region 45 |
|---------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| State | Suppressed | | | | |
| Scope | | | | | |
| Scoping Method | Geometry Selection | | | | |
| Contact | 1 Face | | | | |
| Target | No Selection | | | | |
| Contact Bodies | hole area small 1 | | | | |
| Target Bodies | Solid | | | | |
| Definition | | | | | |
| Type | Bonded | | | | |
| Scope Mode | Automatic | | | | |
| Behavior | Symmetric | | | | |
| Suppressed | No | | | | |
| Advanced | | | | | |
| Formulation | Pure Penalty | | | | |
| Normal Stiffness | Program Controlled | | | | |
| Update Stiffness | Never | | | | |
| Thermal Conductance | Program Controlled | | | | |
| Pinball Region | Program Controlled | | | | |

TABLE 20
Analysis 2.2 > Connections > Contact Regions

| Object Name | Contact Region 46 | Contact Region 47 | Contact Region 48 | Contact Region 49 | Contact Region 50 |
|---------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| State | Suppressed | | | | |
| Scope | | | | | |
| Scoping Method | Geometry Selection | | | | |
| Contact | 1 Face | | | | |
| Target | No Selection | | | | |
| Contact Bodies | hole area short 2 | | | | |
| Target Bodies | carbon rod 1 | carbon rod 3 | carbon rod 4 | carbon rod 5 | carbon rod 6 |
| Definition | | | | | |
| Type | Bonded | | | | |
| Scope Mode | Automatic | | | | |
| Behavior | Symmetric | | | | |
| Suppressed | No | | | | |
| Advanced | | | | | |
| Formulation | Pure Penalty | | | | |
| Normal Stiffness | Program Controlled | | | | |
| Update Stiffness | Never | | | | |
| Thermal Conductance | Program Controlled | | | | |
| Pinball Region | Program Controlled | | | | |

TABLE 21
Analysis 2.2 > Connections > Contact Regions

| Object Name | Contact Region 51 | Contact Region 52 | Contact Region 53 | Contact Region 54 | Contact Region 55 |
|---------------------|--------------------|-------------------|-------------------|-------------------|-------------------|
| State | Suppressed | | | | |
| Scope | | | | | |
| Scoping Method | Geometry Selection | | | | |
| Contact | 1 Face | | | | |
| Target | No Selection | | | | |
| Contact Bodies | hole area short 2 | | | | |
| Target Bodies | Solid | | | | |
| Definition | | | | | |
| Type | Bonded | | | | |
| Scope Mode | Automatic | | | | |
| Behavior | Symmetric | | | | |
| Suppressed | No | | | | |
| Advanced | | | | | |
| Formulation | Pure Penalty | | | | |
| Normal Stiffness | Program Controlled | | | | |
| Update Stiffness | Never | | | | |
| Thermal Conductance | Program Controlled | | | | |
| Pinball Region | Program Controlled | | | | |

TABLE 22
Analysis 2.2 > Connections > Contact Regions

| Object Name | Contact Region 56 | Contact Region 57 | Contact Region 58 | Contact Region 59 | Contact Region 60 |
|---------------------|--------------------|-------------------|-------------------|-------------------|-------------------|
| State | Fully Defined | | | | Suppressed |
| Scope | | | | | |
| Scoping Method | Geometry Selection | | | | |
| Contact | 1 Face | | | | No Selection |
| Target | 1 Face | | | | No Selection |
| Contact Bodies | back plate | | | | carbon rod 1 |
| Target Bodies | slider hinge 1 | slider hinge 2 | slider hinge 3 | slider hinge 4 | Solid |
| Definition | | | | | |
| Type | Bonded | | | | |
| Scope Mode | Automatic | | | | |
| Behavior | Symmetric | | | | |
| Suppressed | No | | | | |
| Advanced | | | | | |
| Formulation | Pure Penalty | | | | |
| Normal Stiffness | Program Controlled | | | | |
| Update Stiffness | Never | | | | |
| Thermal Conductance | Program Controlled | | | | |
| Pinball Region | Program Controlled | | | | |

TABLE 23
Analysis 2.2 > Connections > Contact Regions

| Object Name | Contact Region 61 | Contact Region 62 | Contact Region 63 | Contact Region 64 | Contact Region 65 |
|-------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| | | | | | |

| | | | |
|---------------------|--------------------|--------------|--------------|
| State | Suppressed | | |
| Scope | | | |
| Scoping Method | Geometry Selection | | |
| Contact | No Selection | | |
| Target | No Selection | | |
| Contact Bodies | carbon rod 1 | carbon rod 2 | carbon rod 3 |
| Target Bodies | Solid | | |
| Definition | | | |
| Type | Bonded | | |
| Scope Mode | Automatic | | |
| Behavior | Symmetric | | |
| Suppressed | No | | |
| Advanced | | | |
| Formulation | Pure Penalty | | |
| Normal Stiffness | Program Controlled | | |
| Update Stiffness | Never | | |
| Thermal Conductance | Program Controlled | | |
| Pinball Region | Program Controlled | | |

TABLE 24
Analysis 2.2 > Connections > Contact Regions

| Object Name | <i>Contact Region 66</i> | <i>Contact Region 67</i> | <i>Contact Region 68</i> | <i>Contact Region 69</i> | <i>Contact Region 70</i> |
|---------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| State | Suppressed | | | | |
| Scope | | | | | |
| Scoping Method | Geometry Selection | | | | |
| Contact | No Selection | | | | |
| Target | No Selection | | | | |
| Contact Bodies | carbon rod 4 | | carbon rod 5 | | carbon rod 6 |
| Target Bodies | Solid | | | | |
| Definition | | | | | |
| Type | Bonded | | | | |
| Scope Mode | Automatic | | | | |
| Behavior | Symmetric | | | | |
| Suppressed | No | | | | |
| Advanced | | | | | |
| Formulation | Pure Penalty | | | | |
| Normal Stiffness | Program Controlled | | | | |
| Update Stiffness | Never | | | | |
| Thermal Conductance | Program Controlled | | | | |
| Pinball Region | Program Controlled | | | | |

TABLE 25
Analysis 2.2 > Connections > Contact Regions

| Object Name | <i>Contact Region 71</i> | <i>Contact Region 72</i> | <i>Contact Region 73</i> | <i>Contact Region 74</i> | <i>Contact Region 75</i> |
|----------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| State | Suppressed | | | | |
| Scope | | | | | |
| Scoping Method | Geometry Selection | | | | |

| | | |
|---------------------|--------------------|-------|
| Contact | No Selection | |
| Target | No Selection | |
| Contact Bodies | carbon rod 6 | Solid |
| Target Bodies | Solid | |
| Definition | | |
| Type | Bonded | |
| Scope Mode | Automatic | |
| Behavior | Symmetric | |
| Suppressed | No | |
| Advanced | | |
| Formulation | Pure Penalty | |
| Normal Stiffness | Program Controlled | |
| Update Stiffness | Never | |
| Thermal Conductance | Program Controlled | |
| Pinball Region | Program Controlled | |

TABLE 26
Analysis 2.2 > Connections > Contact Regions

| | | | | |
|---------------------|--------------------------|--------------------------|---|---|
| Object Name | <i>Contact Region 76</i> | <i>Contact Region 77</i> | <i>Bonded - End Plate 2 To back plate</i> | <i>Bonded - End plate 1 To back plate</i> |
| State | Suppressed | | Fully Defined | |
| Scope | | | | |
| Scoping Method | Geometry Selection | | | |
| Contact | No Selection | | 1 Face | |
| Target | No Selection | | 1 Face | |
| Contact Bodies | Solid | End Plate 2 | | End plate 1 |
| Target Bodies | Solid | back plate | | |
| Definition | | | | |
| Type | Bonded | | | |
| Scope Mode | Automatic | Manual | | |
| Behavior | Symmetric | | | |
| Suppressed | No | | | |
| Advanced | | | | |
| Formulation | Pure Penalty | | | |
| Normal Stiffness | Program Controlled | | | |
| Update Stiffness | Never | | | |
| Thermal Conductance | Program Controlled | | | |
| Pinball Region | Program Controlled | | | |

Mesh

TABLE 27
Analysis 2.2 > Mesh

| | |
|--------------------|-------------|
| Object Name | <i>Mesh</i> |
| State | Solved |
| Defaults | |
| Physics Preference | Mechanical |
| Relevance | 0 |
| Advanced | |
| | |

| | |
|-----------------------------|---------------------|
| 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 |
| Statistics | |
| Nodes | 5398 |
| Elements | 759 |

Static Structural

TABLE 28
Analysis 2.2 > Analysis

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

TABLE 29
Analysis 2.2 > Static Structural > Analysis Settings

| | |
|---------------------------------|--------------------------|
| Object Name | <i>Analysis Settings</i> |
| State | Fully Defined |
| Step Controls | |
| Number Of Steps | 1. |
| Current Step Number | 1. |
| Step End Time | 1. s |
| Auto Time Stepping | Program Controlled |
| Solver Controls | |
| Solver Type | Program Controlled |
| Weak Springs | Program Controlled |
| Large Deflection | Off |
| Inertia Relief | Off |
| Nonlinear Controls | |
| Force Convergence | Program Controlled |
| Moment Convergence | Program Controlled |
| Displacement Convergence | Program Controlled |
| Rotation Convergence | Program Controlled |
| Line Search | Program Controlled |
| Output Controls | |
| Calculate Stress | Yes |
| Calculate Strain | Yes |
| Calculate Results At | All Time Points |
| Analysis Data Management | |

| | |
|------------------------|--|
| Solver Files Directory | C:\Documents and Settings\Jinnuri\Desktop\website\full2\ful2 Simulation Files\Static Structural\ |
| Future Analysis | None |
| Save ANSYS db | No |
| Delete Unneeded Files | Yes |
| Nonlinear Solution | No |

TABLE 30
Analysis 2.2 > Static Structural > Accelerations

| | |
|-------------------|----------------------------------|
| Object Name | <i>Acceleration</i> |
| State | Suppressed |
| Scope | |
| Geometry | All Bodies |
| Definition | |
| Define By | Components |
| X Component | 0. mm/s ² (ramped) |
| Y Component | 9810. mm/s ² (ramped) |
| Z Component | 0. mm/s ² (ramped) |
| Suppressed | Yes |

FIGURE 1
Analysis 2.2 > Static Structural > Acceleration

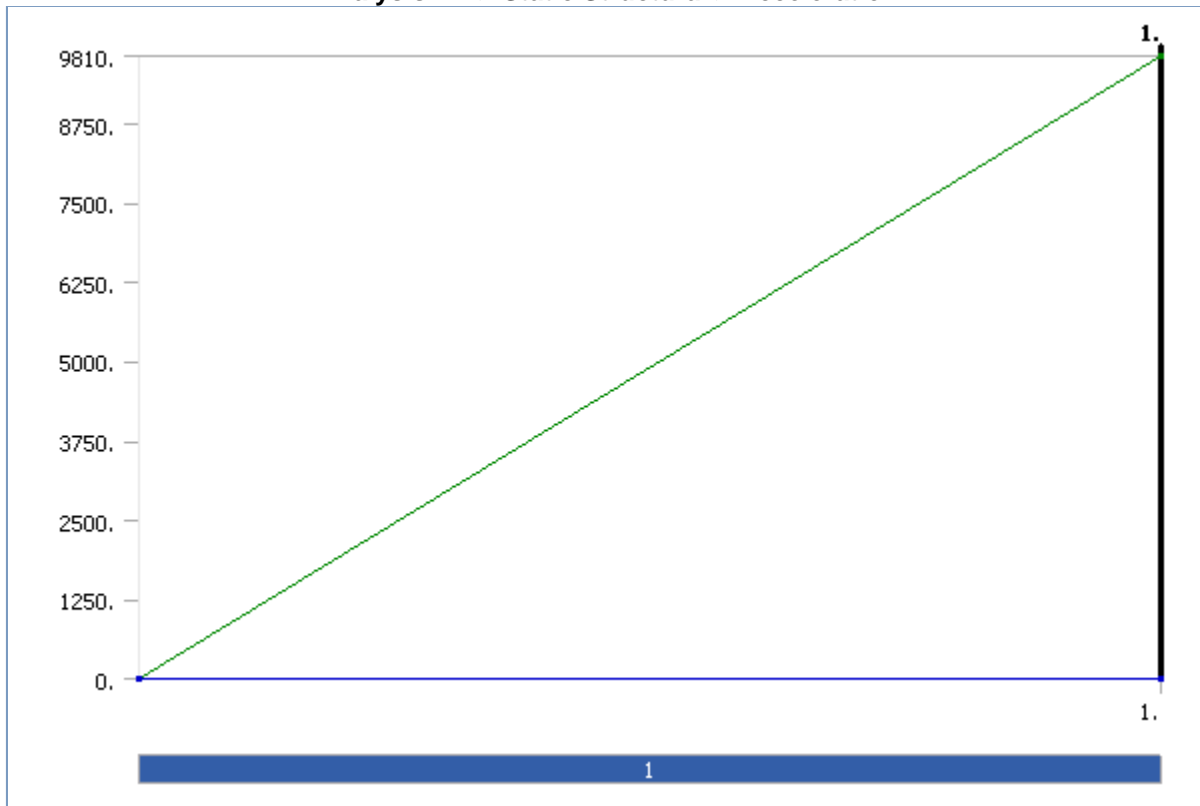


TABLE 31
Analysis 2.2 > Static Structural > Loads

| | | | | | |
|--------------|---------------|----------------|----------------|----------------|----------------------|
| Object Name | <i>Force</i> | <i>Force 2</i> | <i>Force 3</i> | <i>Force 4</i> | <i>Fixed Support</i> |
| State | Fully Defined | | | | |
| Scope | | | | | |
| Scoping | | | | | |

| | | | | |
|-------------------|--------------------|-------------------|--------------------|-------------------|
| Method | Geometry Selection | | | |
| Geometry | 1 Face | | 2 Faces | |
| Definition | | | | |
| Define By | Components | | | |
| Type | Force | | | Fixed Support |
| X Component | -1504.1 N (ramped) | | 1504.1 N (ramped) | |
| Y Component | -158.08 N (ramped) | 158.08 N (ramped) | -158.08 N (ramped) | 158.08 N (ramped) |
| Z Component | 0. N (ramped) | | | |
| Suppressed | No | | | |

FIGURE 2
Analysis 2.2 > Static Structural > Force

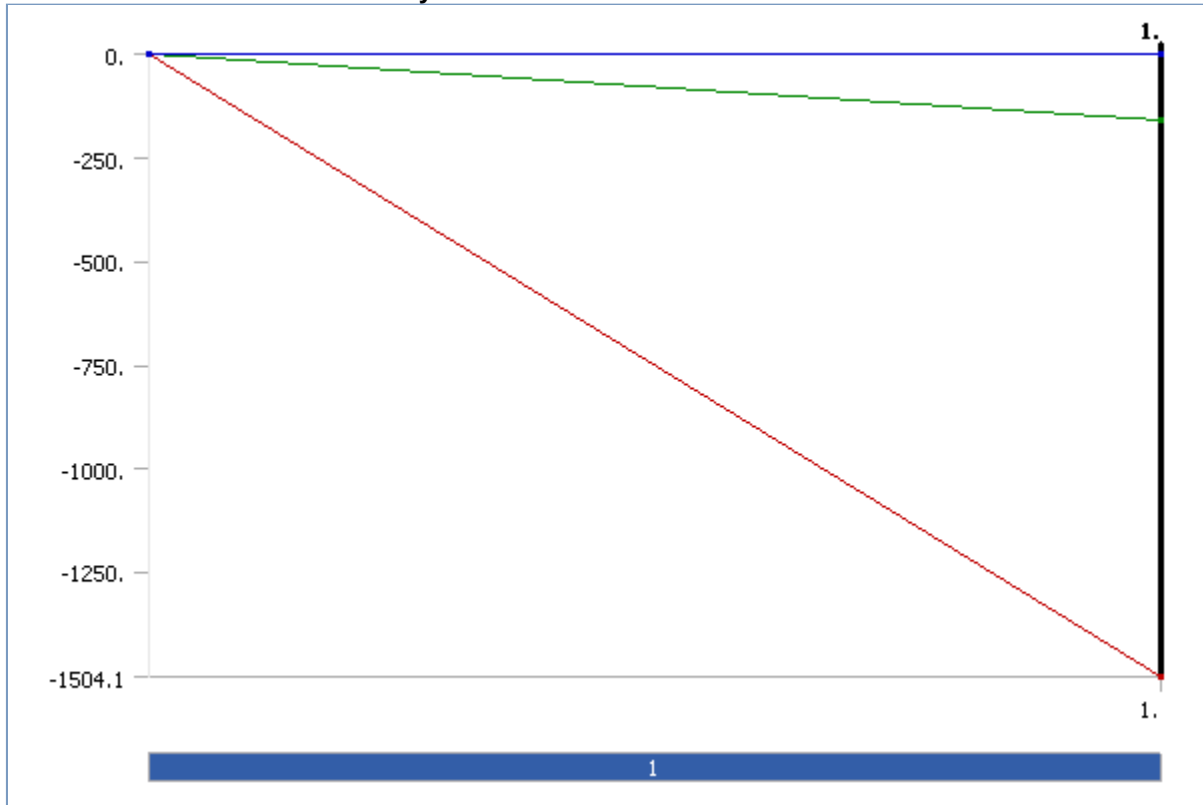


FIGURE 3
Analysis 2.2 > Static Structural > Force 2

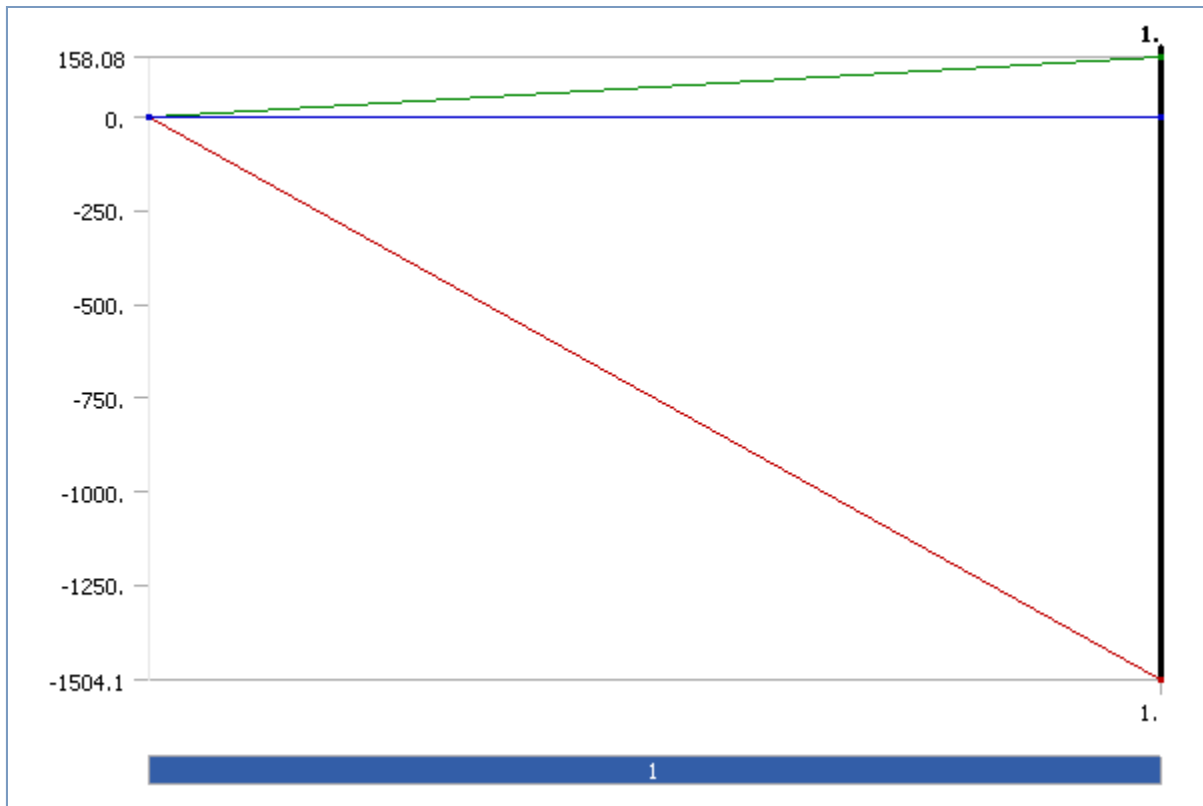


FIGURE 4
Analysis 2.2 > Static Structural > Force 3

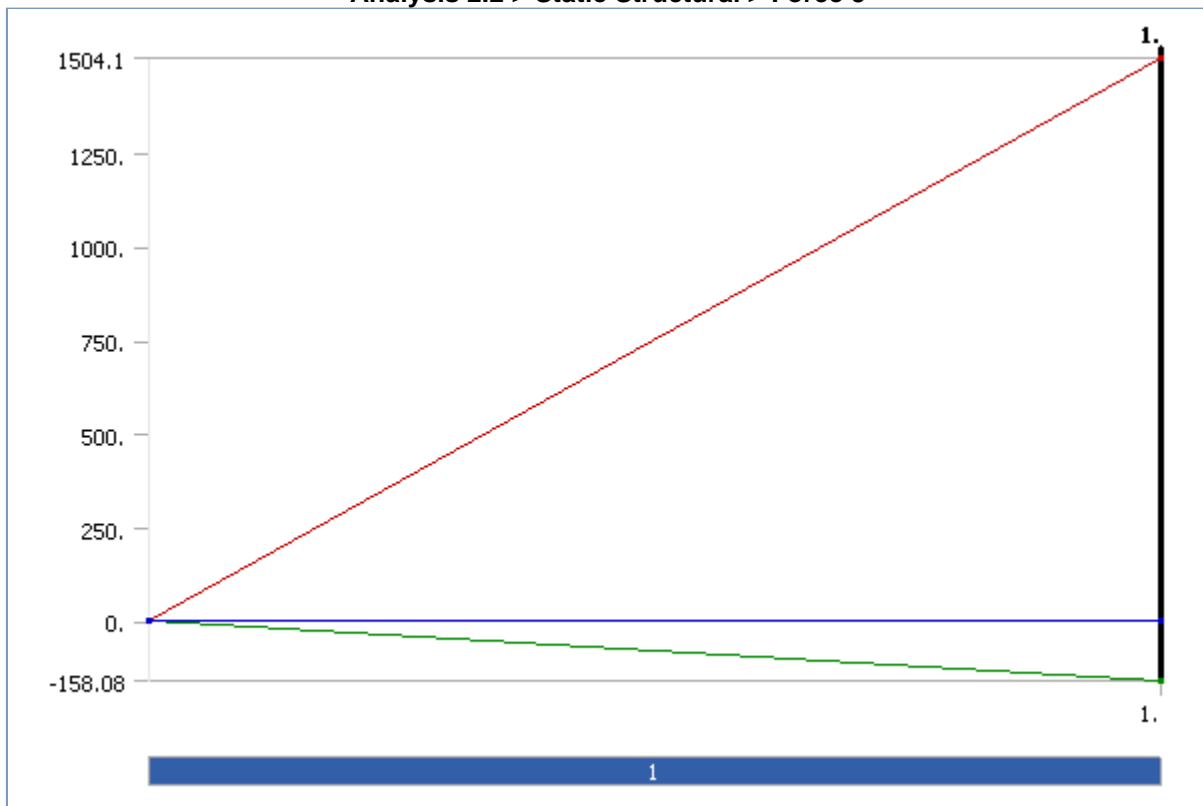


FIGURE 5
Analysis 2.2 > Static Structural > Force 4

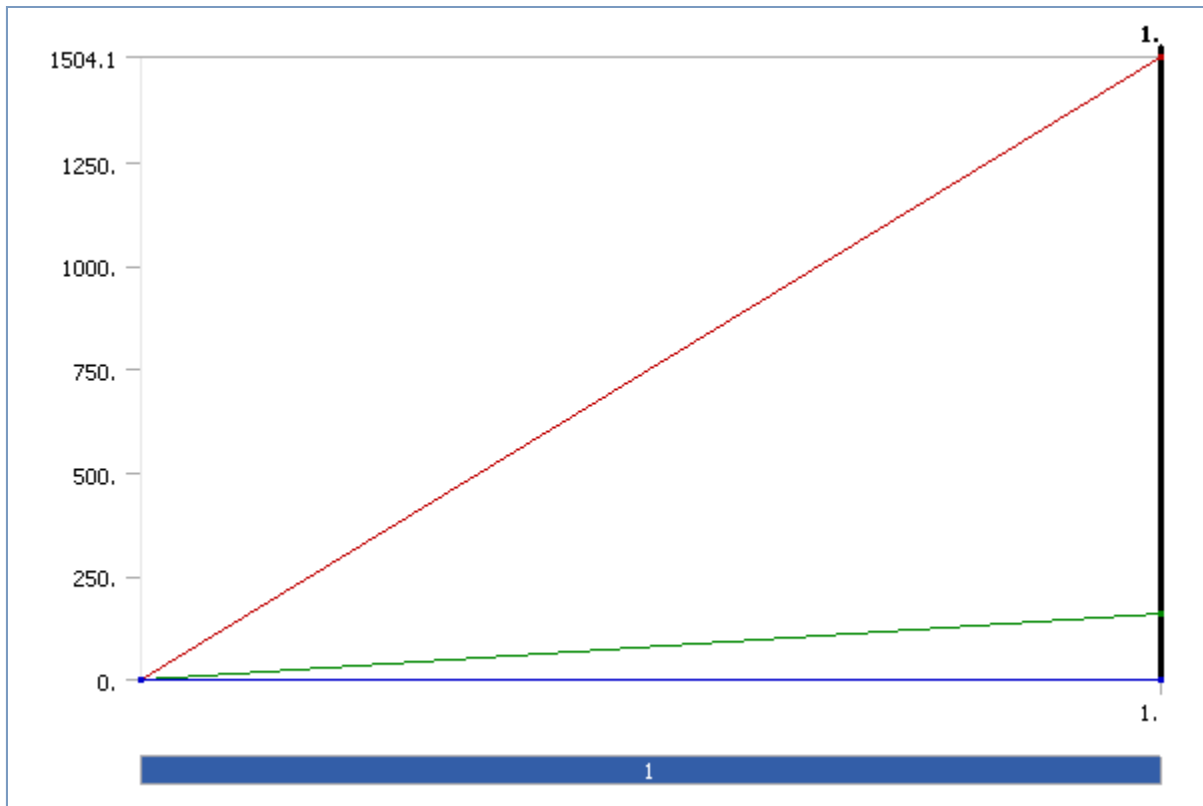
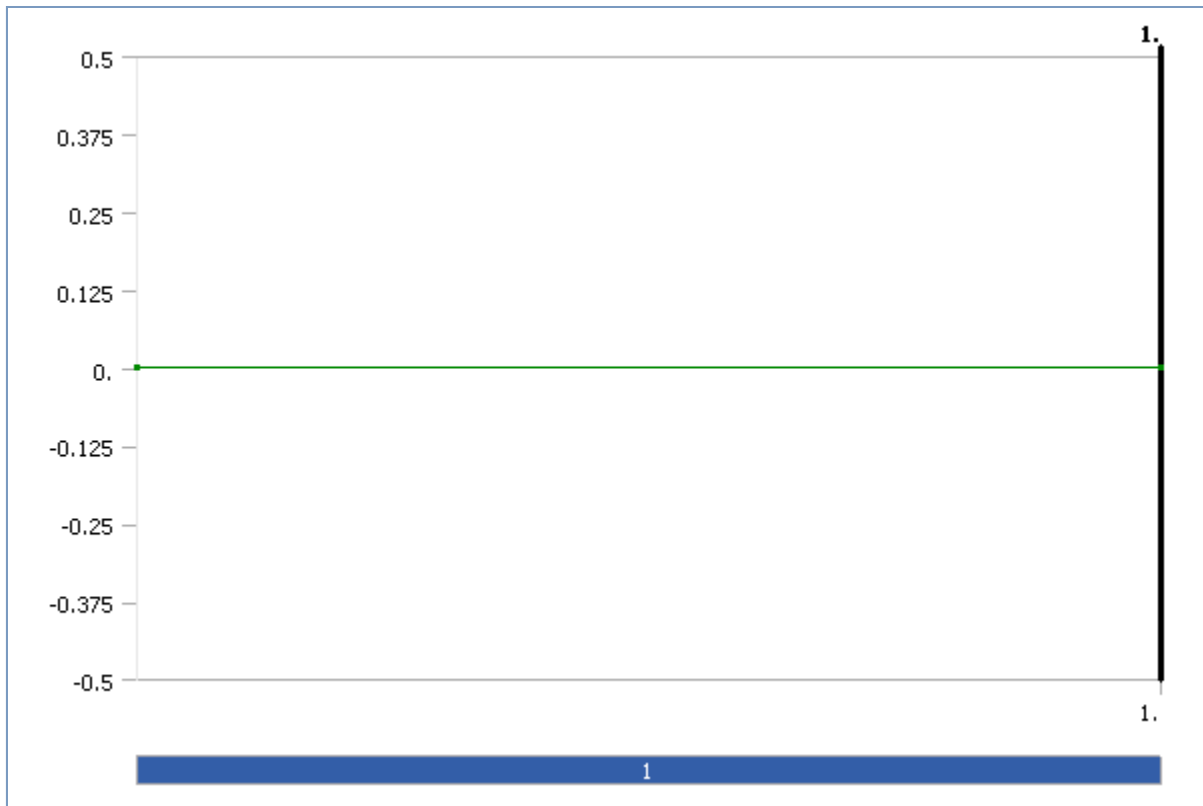


TABLE 32
Analysis 2.2 > Static Structural > Loads

| | | |
|-------------------|---------------------|------------------------|
| Object Name | <i>Displacement</i> | <i>Fixed Support 2</i> |
| State | Fully Defined | |
| Scope | | |
| Scoping Method | Geometry Selection | |
| Geometry | 2 Faces | 1 Face |
| Definition | | |
| Define By | Components | |
| Type | Displacement | Fixed Support |
| X Component | Free | |
| Y Component | 0. mm (ramped) | |
| Z Component | 0. mm (ramped) | |
| Suppressed | No | |

FIGURE 6
Analysis 2.2 > Static Structural > Displacement



Solution

TABLE 33
Analysis 2.2 > Static Structural > Solution

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

TABLE 34
Analysis 2.2 > Static Structural > Solution > Solution Information

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

TABLE 35
Analysis 2.2 > Static Structural > Solution > Results

| Object Name | <i>Total Deformation</i> | <i>Directional Deformation-x</i> | <i>Directional Deformation -y</i> | <i>Directional Deformation -z</i> |
|-------------------|--------------------------|----------------------------------|-----------------------------------|-----------------------------------|
| State | Solved | | | |
| Scope | | | | |
| Geometry | All Bodies | | | |
| Definition | | | | |

| Type | Total Deformation | Directional Deformation | | |
|--------------------|-------------------|-------------------------|------------|-----------------|
| Display Time | End Time | | | |
| Orientation | | X Axis | Y Axis | Z Axis |
| Results | | | | |
| Minimum | 0. mm | -16.228 mm | -1.2873 mm | -7.9362e-002 mm |
| Maximum | 19.952 mm | 17.391 mm | 9.8084 mm | 0.48425 mm |
| Minimum Occurs On | slider hinge 1 | End plate 1 | | back plate |
| Maximum Occurs On | End Plate 2 | | | |
| Information | | | | |
| Time | 1. s | | | |
| Load Step | 1 | | | |
| Substep | 1 | | | |
| Iteration Number | 1 | | | |

FIGURE 7
Analysis 2.2 > Static Structural > Solution > Total Deformation > Figure

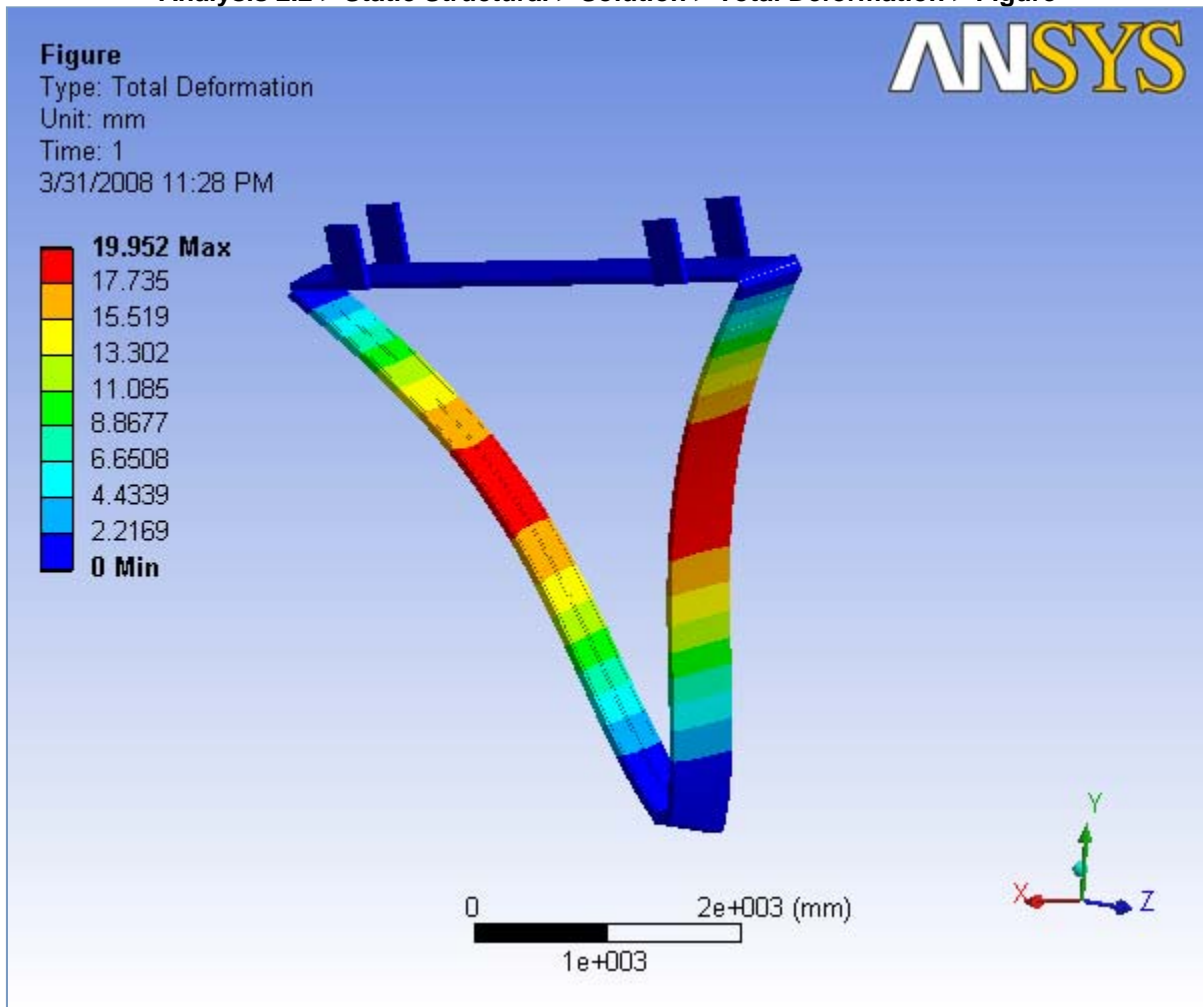


FIGURE 8
Analysis 2.2 > Static Structural > Solution > Directional Deformation-x > Figure

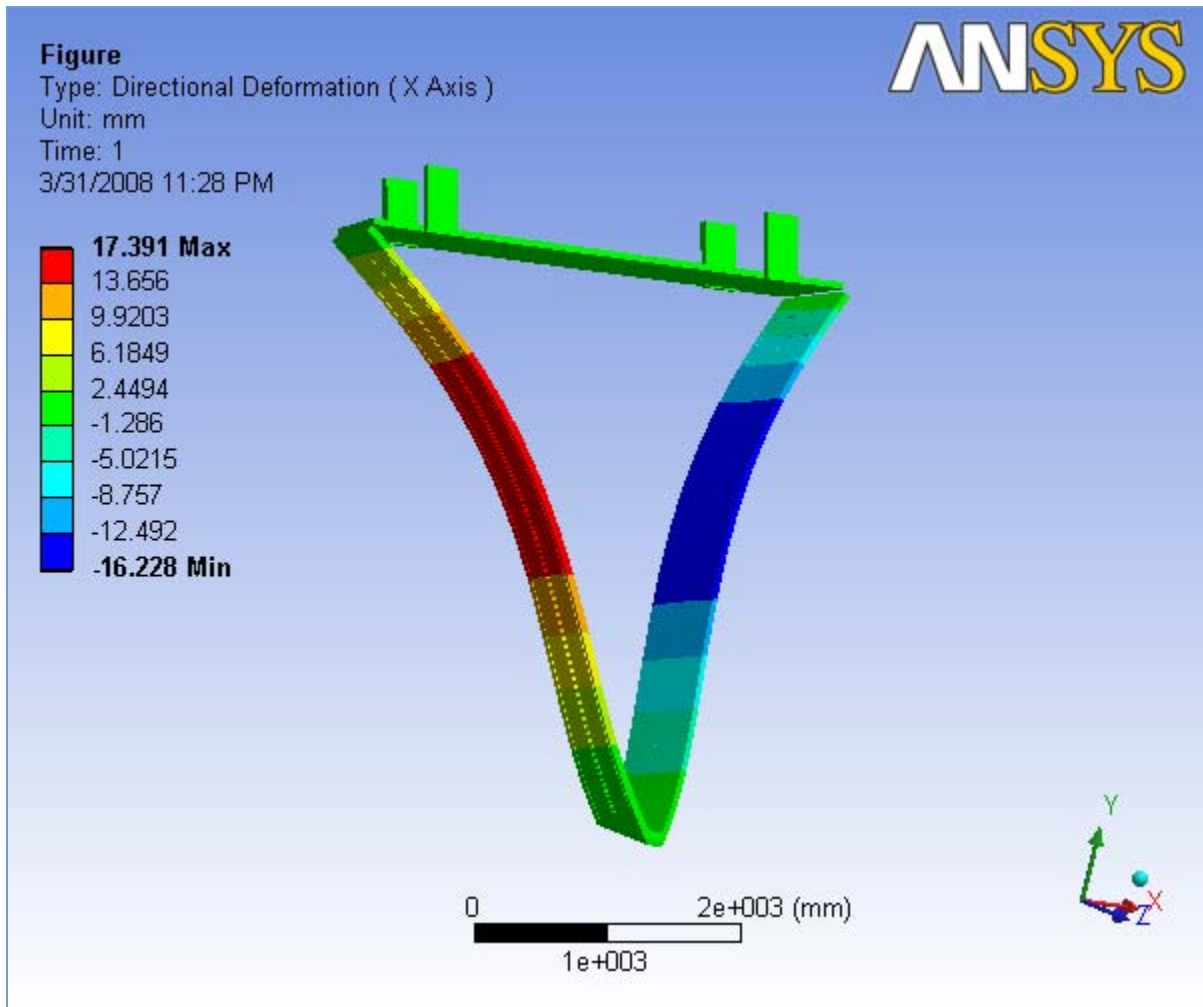


FIGURE 9
 Analysis 2.2 > Static Structural > Solution > Directional Deformation -y > Figure

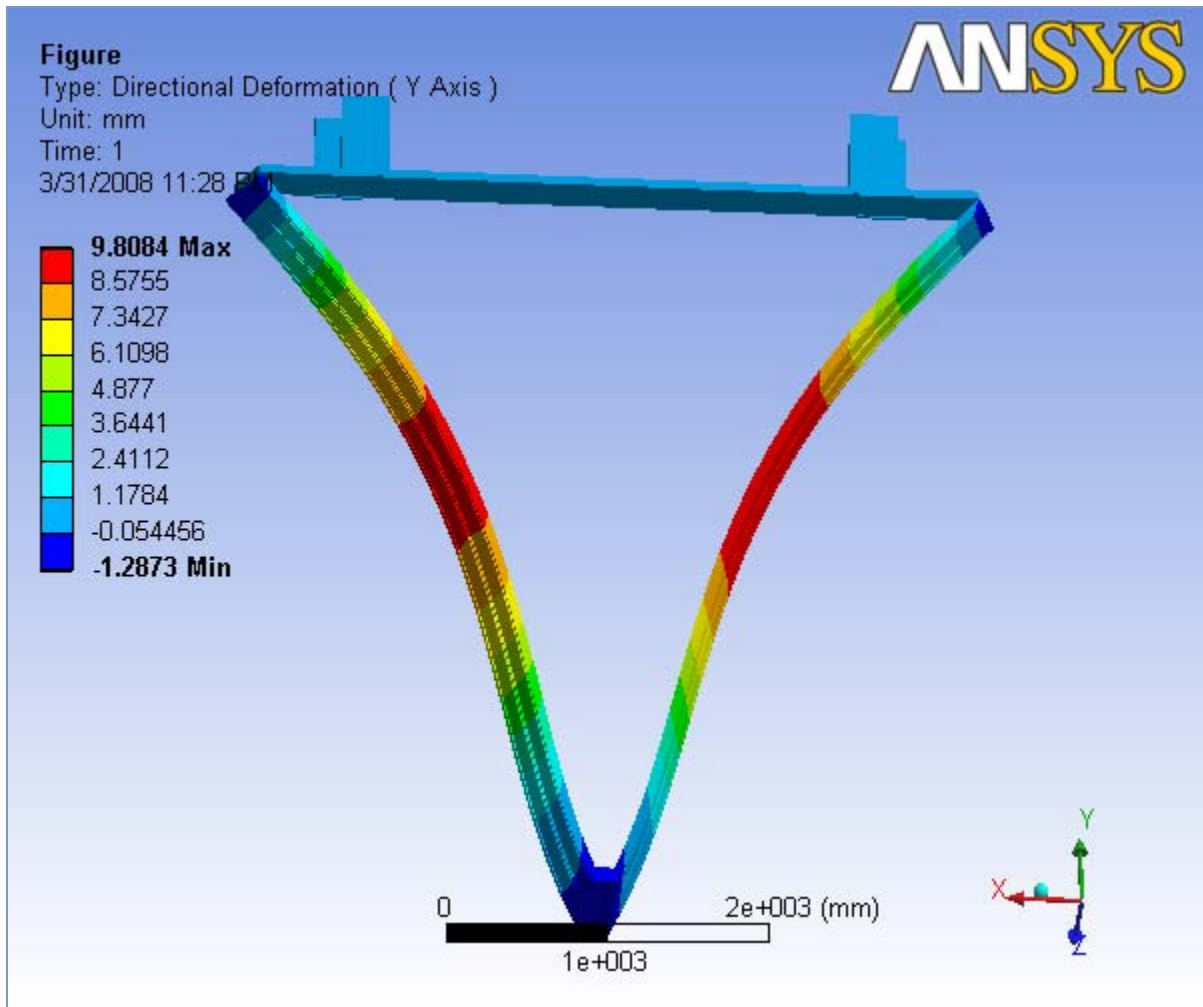
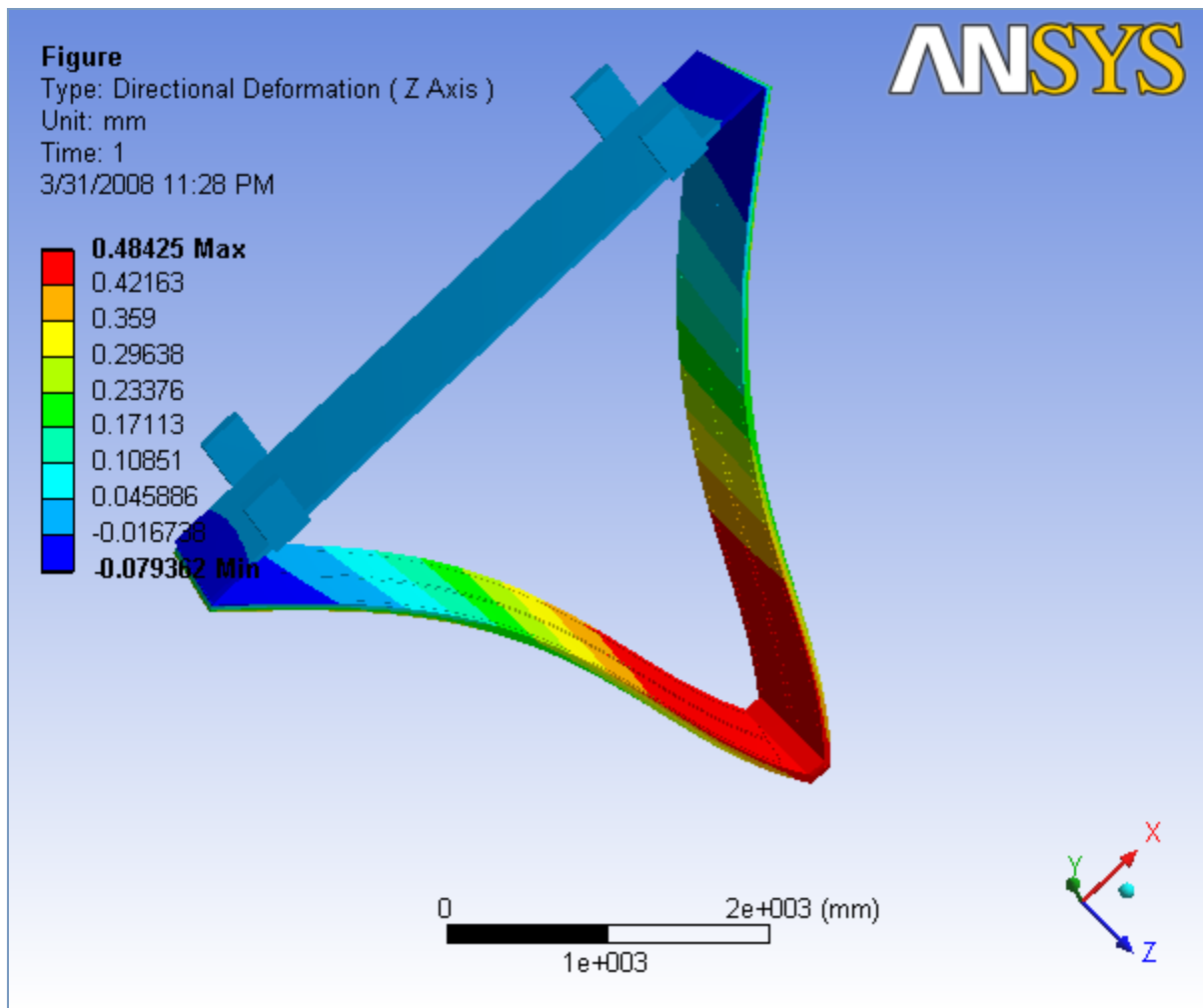


FIGURE 10
 Analysis 2.2 > Static Structural > Solution > Directional Deformation -z > Figure



Material Data

Polyurethane

TABLE 36
Polyurethane > Constants

| Structural | |
|-------------------------|-----------------------------|
| Young's Modulus | 9751.9 MPa |
| Poisson's Ratio | 0.3 |
| Density | 2.4e-007 kg/mm ³ |
| Thermal Expansion | 1.2e-005 1/°C |
| Thermal | |
| Thermal Conductivity | 0. W/mm·°C |
| Specific Heat | 0. J/kg·°C |
| Electromagnetics | |
| Relative Permeability | 0. |
| Resistivity | 0. Ohm-mm |

Carbon Fiber

TABLE 37

Carbon Fiber > Constants

| Structural | |
|-------------------------|-----------------------------|
| Young's Modulus | 1.5e+005 MPa |
| Poisson's Ratio | 0.3 |
| Density | 5.8e-007 kg/mm ³ |
| Thermal Expansion | 1.2e-005 1/°C |
| Thermal | |
| Thermal Conductivity | 0. W/mm·°C |
| Specific Heat | 0. J/kg·°C |
| Electromagnetics | |
| Relative Permeability | 0. |
| Resistivity | 0. Ohm·mm |