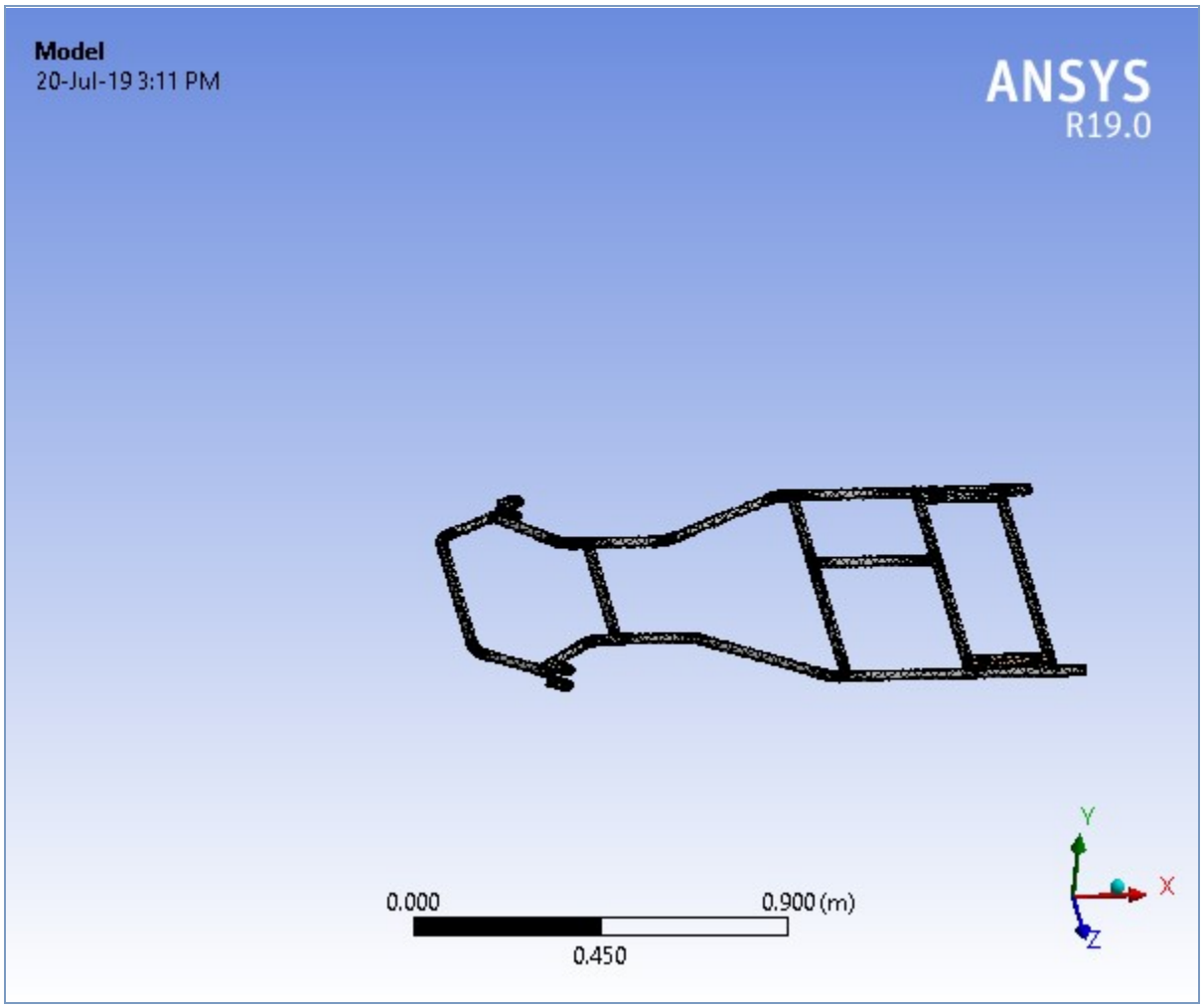
Project

First Saved	20 July, 2019
Last Saved	20 July, 2019
Product Version	19.0 Release
Save Project Before Solution	No
Save Project After Solution	No



Contents

Units

TABLE 1

Unit System	Metric (m, kg, N, s, V, A) Degrees rad/s Celsius
Angle	Degrees
Rotational Velocity	rad/s
Temperature	Celsius

Model (A4)

Geometry

TABLE 2
Model (A4) > Geometry

Object Name	*Geometry*
State	Fully Defined
Definition	
Source	C:\Users\bcr\AppData\Local\Temp\WB_DESKTOP-8M3HQJM_bcr_6884_2 \unsaved_project_files\dp0\SYS\DM\SYS.agdb
Type	DesignModeler
Length Unit	Meters
Element Control	Program Controlled
Display Style	Body Color
Bounding Box	
Length X	1.4874 m
Length Y	5.e-002 m

Length Z	0.7883 m
Properties	
Volume	1.1793e-003 m³
Mass	9.2573 kg
Scale Factor Value	1.
Statistics	
Bodies	5
Active Bodies	5
Nodes	32163
Elements	15852
Mesh Metric	None
Basic Geometry Options	
Parameters	Independent
Parameter Key	
Attributes	Yes
Attribute Key	
Named Selections	Yes
Named Selection Key	
Material Properties	Yes
Advanced Geometry Options	
Use Associativity	Yes
Coordinate Systems	Yes
Coordinate System Key	
Reader Mode Saves Updated File	No
Use Instances	Yes
Smart CAD Update	Yes
Compare Parts On Update	No
Analysis Type	3-D
Decompose Disjoint Geometry	Yes
Enclosure and Symmetry Processing	Yes

TABLE 3
Model (A4) > Geometry > Parts

Object Name	*Solid*	*Solid*	*Solid*	*Solid*	*Solid*
State	Meshed				
Graphics Properties					
Visible	Yes				
Definition					
Suppressed	No				
Stiffness Behavior	Flexible				
Coordinate System	Default Coordinate System				
Reference Temperature	By Environment				
Behavior	None				
Material					
Assignment	AISI4130	Structural Steel			
Nonlinear Effects	Yes				
Thermal Strain Effects	Yes				
Bounding Box					
Length X	1.4874 m	6.4648e-002 m	0.19924 m		

Length Y	2.63e-002 m	5.e-002 m		2.6e-002 m	
Length Z	0.7883 m	5.7258e-002 m		4.5e-002 m	
Properties					
Volume	9.9157e-004 m³	3.4502e-005 m³		5.9348e-005 m³	
Mass	7.7839 kg	0.27084 kg		0.46588 kg	
Centroid X	0.8044 m	0.18665 m		1.2954 m	
Centroid Y	5.2595e-007 m	3.4453e-010 m	-3.4453e-010 m	6.3285e-003 m	
Centroid Z	-4.0746e-003 m	-0.3461 m	0.3461 m	0.35175 m	-0.35175 m
Moment of Inertia Ip1	0.51558 kg·m²	1.4096e-004 kg·m²		1.2056e-004 kg·m²	
Moment of Inertia Ip2	2.1563 kg·m²	1.2124e-004 kg·m²		1.4419e-003 kg·m²	
Moment of Inertia Ip3	1.6418 kg·m²	1.9138e-004 kg·m²		1.3515e-003 kg·m²	
Statistics					
Nodes	29225	664	687	797	790
Elements	14626	281	300	325	320
Mesh Metric	None				

Coordinate Systems

TABLE 4
Model (A4) > Coordinate Systems > Coordinate System

Object Name	*Global Coordinate System*
State	Fully Defined
Definition	
Type	Cartesian
Coordinate System ID	0.
Origin	
Origin X	0. m
Origin Y	0. m
Origin Z	0. m
Directional Vectors	
X Axis Data	[1. 0. 0.]
Y Axis Data	[0. 1. 0.]
Z Axis Data	[0. 0. 1.]

Connections

TABLE 5
Model (A4) > Connections

Object Name	*Connections*
State	Fully Defined
Auto Detection	
Generate Automatic Connection On Refresh	Yes
Transparency	
Enabled	Yes

TABLE 6
Model (A4) > Connections > Contacts

Object Name	*Contacts*
State	Fully Defined
Definition	
Connection Type	Contact
Scope	

Scoping Method	Geometry Selection
Geometry	All Bodies
Auto Detection	
Tolerance Type	Slider
Tolerance Slider	0.
Tolerance Value	4.2104e-003 m
Use Range	No
Face/Face	Yes
Face Overlap Tolerance	Off
Cylindrical Faces	Include
Face/Edge	No
Edge/Edge	No
Priority	Include All
Group By	Bodies
Search Across	Bodies
Statistics	
Connections	4
Active Connections	4

TABLE 7
Model (A4) > Connections > Contacts > Contact Regions

Object Name	*Contact Region*	*Contact Region 2*	*Contact Region 3*	*Contact Region 4*
State	Fully Defined			
Scope				
Scoping Method	Geometry Selection			
Contact	1 Face		10 Faces	
Target	1 Face		6 Faces	
Contact Bodies	Solid			
Target Bodies	Solid			
Protected	No			
Definition				
Type	Bonded			
Scope Mode	Automatic			
Behavior	Program Controlled			
Trim Contact	Program Controlled			
Trim Tolerance	4.2104e-003 m			
Suppressed	No			
Advanced				
Formulation	Program Controlled			
Small Sliding	Program Controlled			
Detection Method	Program Controlled			
Penetration Tolerance	Program Controlled			
Elastic Slip Tolerance	Program Controlled			
Normal Stiffness	Program Controlled			
Update Stiffness	Program Controlled			
Pinball Region	Program Controlled			
Geometric Modification				
Contact Geometry Correction	None			
Target Geometry Correction	None			

Mesh

TABLE 8
Model (A4) > Mesh

Object Name	*Mesh*
State	Solved
Display	
Display Style	Body Color
Defaults	
Physics Preference	Mechanical
Relevance	0
Element Order	Program Controlled
Sizing	
Size Function	Adaptive
Relevance Center	Coarse
Element Size	Default
Mesh Defeaturing	Yes
Defeature Size	Default
Transition	Fast
Initial Size Seed	Assembly
Span Angle Center	Coarse
Bounding Box Diagonal	1.68420 m
Average Surface Area	6.7981e-003 m²
Minimum Edge Length	2.3504e-003 m
Quality	
Check Mesh Quality	Yes, Errors
Error Limits	Standard Mechanical
Target Quality	Default (0.050000)
Smoothing	Medium
Mesh Metric	None
Inflation	
Use Automatic Inflation	None
Inflation Option	Smooth Transition
Transition Ratio	0.272
Maximum Layers	5
Growth Rate	1.2
Inflation Algorithm	Pre
View Advanced Options	No
Advanced	
Number of CPUs for Parallel Part Meshing	Program Controlled
Straight Sided Elements	No
Number of Retries	Default (4)
Rigid Body Behavior	Dimensionally Reduced
Triangle Surface Mesher	Program Controlled
Topology Checking	Yes
Pinch Tolerance	Please Define
Generate Pinch on Refresh	No
Statistics	
Nodes	32163
Elements	15852

TABLE 9
Model (A4) > Mesh > Mesh Controls

Object Name	*Patch Conforming Method*
State	Fully Defined

Scope	
Scoping Method	Geometry Selection
Geometry	4 Bodies
Definition	
Suppressed	No
Method	Tetrahedrons
Algorithm	Patch Conforming
Element Order	Use Global Setting

Static Structural (A5)

TABLE 10
Model (A4) > Analysis

Object Name	*Static Structural (A5)*
State	Solved
Definition	
Physics Type	Structural
Analysis Type	Static Structural
Solver Target	Mechanical APDL
Options	
Environment Temperature	22. °C
Generate Input Only	No

TABLE 11
Model (A4) > Static Structural (A5) > Analysis Settings

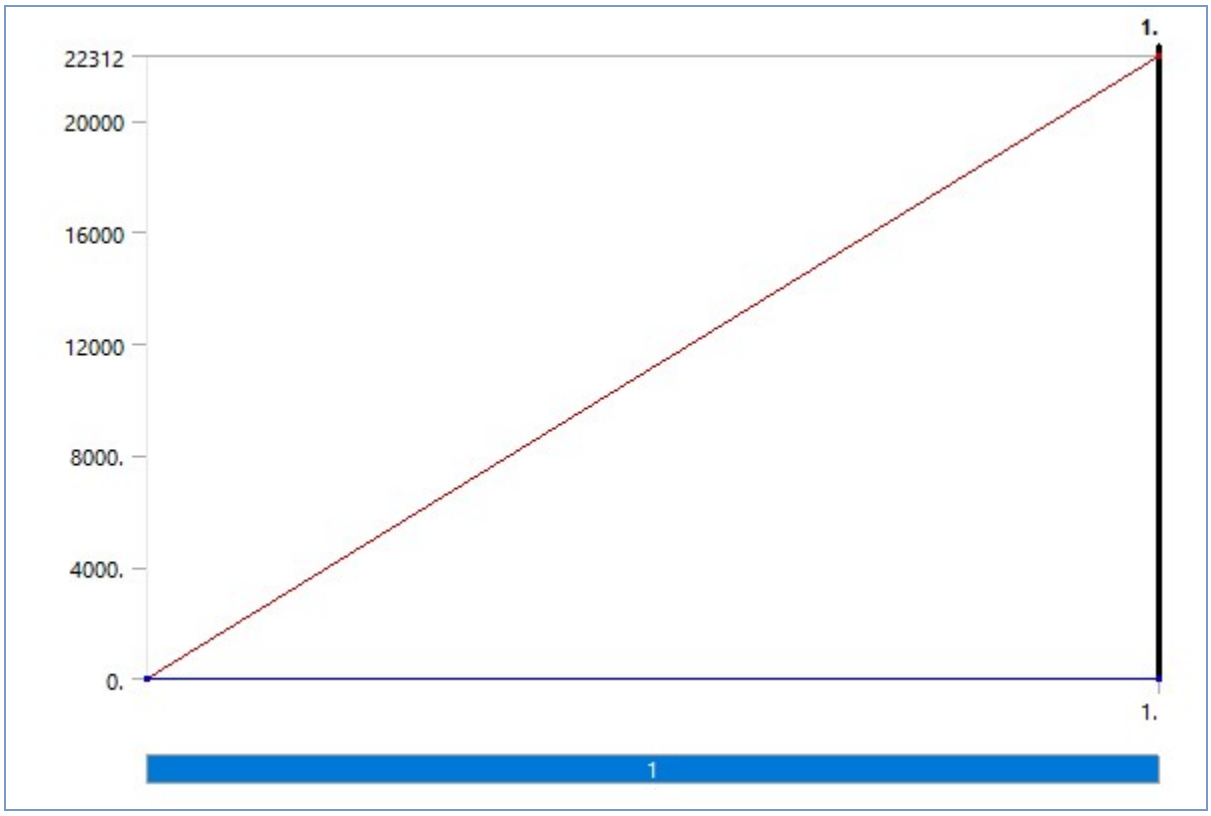
Object Name	*Analysis Settings*
State	Fully Defined
Step Controls	
Number Of Steps	1.
Current Step Number	1.
Step End Time	1. s
Auto Time Stepping	Program Controlled
Solver Controls	
Solver Type	Program Controlled
Weak Springs	Off
Solver Pivot Checking	Program Controlled
Large Deflection	Off
Inertia Relief	Off
Rotordynamics Controls	
Coriolis Effect	Off
Restart Controls	
Generate Restart Points	Program Controlled
Retain Files After Full Solve	No
Combine Restart Files	Program Controlled
Nonlinear Controls	
Newton-Raphson Option	Program Controlled
Force Convergence	Program Controlled
Moment Convergence	Program Controlled
Displacement Convergence	Program Controlled

Rotation Convergence	Program Controlled
Line Search	Program Controlled
Stabilization	Off
Output Controls	
Stress	Yes
Strain	Yes
Nodal Forces	No
Contact Miscellaneous	No
General Miscellaneous	No
Store Results At	All Time Points
Analysis Data Management	
Solver Files Directory	C:\Users\bcr\AppData\Local\Temp\WB_DESKTOP-8M3HQJM_bcr_6884_2 \unsaved_project_files\dp0\SYS\MECH\
Future Analysis	None
Scratch Solver Files Directory	
Save MAPDL db	No
Contact Summary	Program Controlled
Delete Unneeded Files	Yes
Nonlinear Solution	No
Solver Units	Active System
Solver Unit System	mks

TABLE 12
Model (A4) > Static Structural (A5) > Loads

Object Name	*Fixed Support*	*Force*
State	Fully Defined	
Scope		
Scoping Method	Geometry Selection	
Geometry	2 Faces	10 Faces
Definition		
Type	Fixed Support	Force
Suppressed	No	
Define By		Components
Coordinate System		Global Coordinate System
X Component		22312 N (ramped)
Y Component		0. N (ramped)
Z Component		0. N (ramped)

FIGURE 1
Model (A4) > Static Structural (A5) > Force



Solution (A6)

TABLE 13
Model (A4) > Static Structural (A5) > Solution

Object Name	*Solution (A6)*
State	Solved
Adaptive Mesh Refinement	
Max Refinement Loops	1.
Refinement Depth	2.
Information	
Status	Done
MAPDL Elapsed Time	11. s
MAPDL Memory Used	350. MB
MAPDL Result File Size	13.688 MB
Post Processing	
Beam Section Results	No
On Demand Stress/Strain	No

TABLE 14
Model (A4) > Static Structural (A5) > Solution (A6) > Solution Information

Object Name	*Solution Information*
State	Solved
Solution Information	
Solution Output	Solver Output
Newton-Raphson Residuals	0
Identify Element Violations	0
Update Interval	2.5 s
Display Points	All

FE Connection Visibility	
Activate Visibility	Yes
Display	All FE Connectors
Draw Connections Attached To	All Nodes
Line Color	Connection Type
Visible on Results	No
Line Thickness	Single
Display Type	Lines

TABLE 15
Model (A4) > Static Structural (A5) > Solution (A6) > Results

Object Name	*Total Deformation*	*Maximum Principal Elastic Strain*	*Maximum Principal Stress*	*Shear Elastic Strain*	*Directional Deformation*
State	Solved				
Scope					
Scoping Method	Geometry Selection				
Geometry	All Bodies				
Definition					
Type	Total Deformation	Maximum Principal Elastic Strain	Maximum Principal Stress	Shear Elastic Strain	Directional Deformation
By	Time				
Display Time	Last				
Calculate Time History	Yes				
Identifier					
Suppressed	No				
Orientation				XY Plane	X Axis
Coordinate System				Global Coordinate System	
Results					
Minimum	0. m	-1.6001e-005 m/m	-2.1024e+008 Pa	-3.1415e-003 m/m	0. m
Maximum	1.105e-002 m	6.3201e-003 m/m	1.4128e+009 Pa	3.6197e-003 m/m	1.1043e-002 m
Average	1.9686e-003 m	3.1973e-004 m/m	4.5489e+007 Pa	3.2454e-006 m/m	1.6244e-003 m
Minimum Occurs On	Solid				
Maximum Occurs On	Solid				
Information					
Time	1. s				
Load Step	1				
Substep	1				
Iteration Number	1				
Integration Point Results					
Display Option		Averaged			
Average Across Bodies		No			

FIGURE 2
Model (A4) > Static Structural (A5) > Solution (A6) > Total Deformation

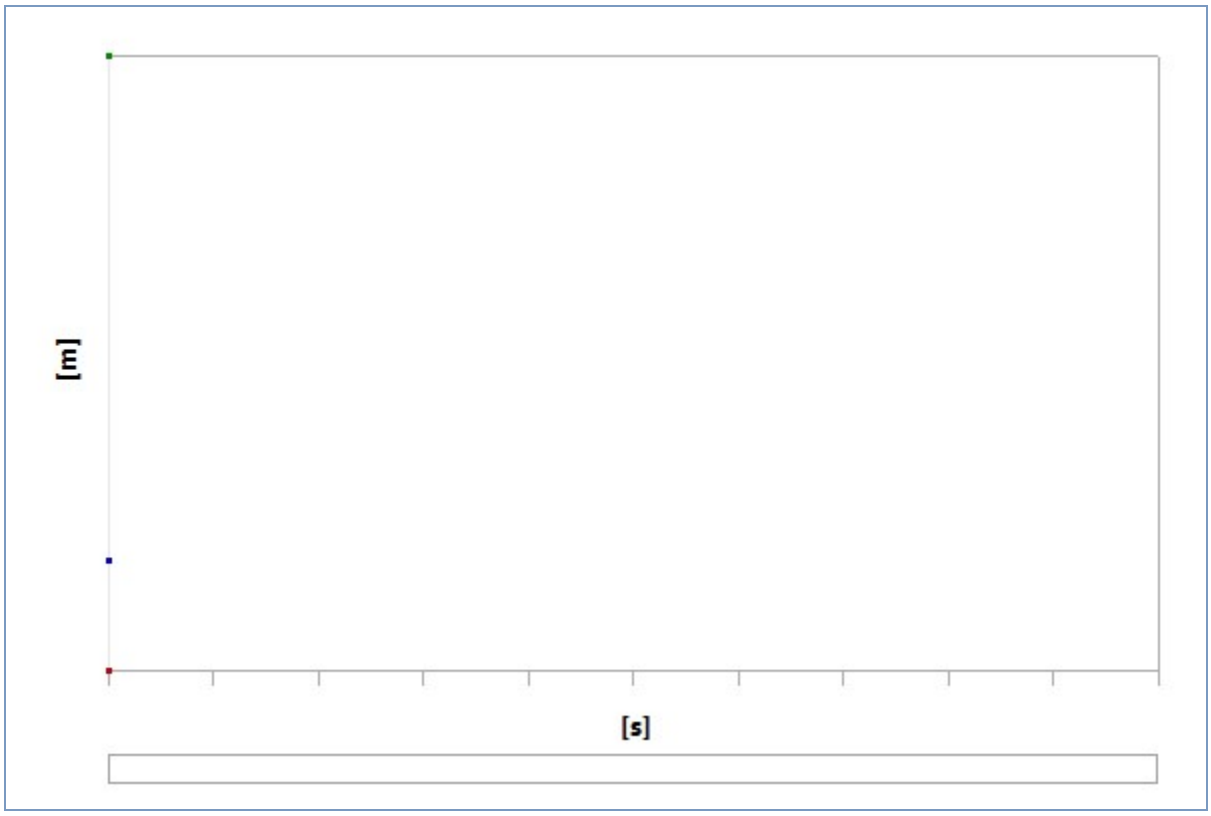


TABLE 16
Model (A4) > Static Structural (A5) > Solution (A6) > Total Deformation

Time [s]	Minimum [m]	Maximum [m]	Average [m]
1.	0.	1.105e-002	1.9686e-003

FIGURE 3
Model (A4) > Static Structural (A5) > Solution (A6) > Maximum Principal Elastic Strain

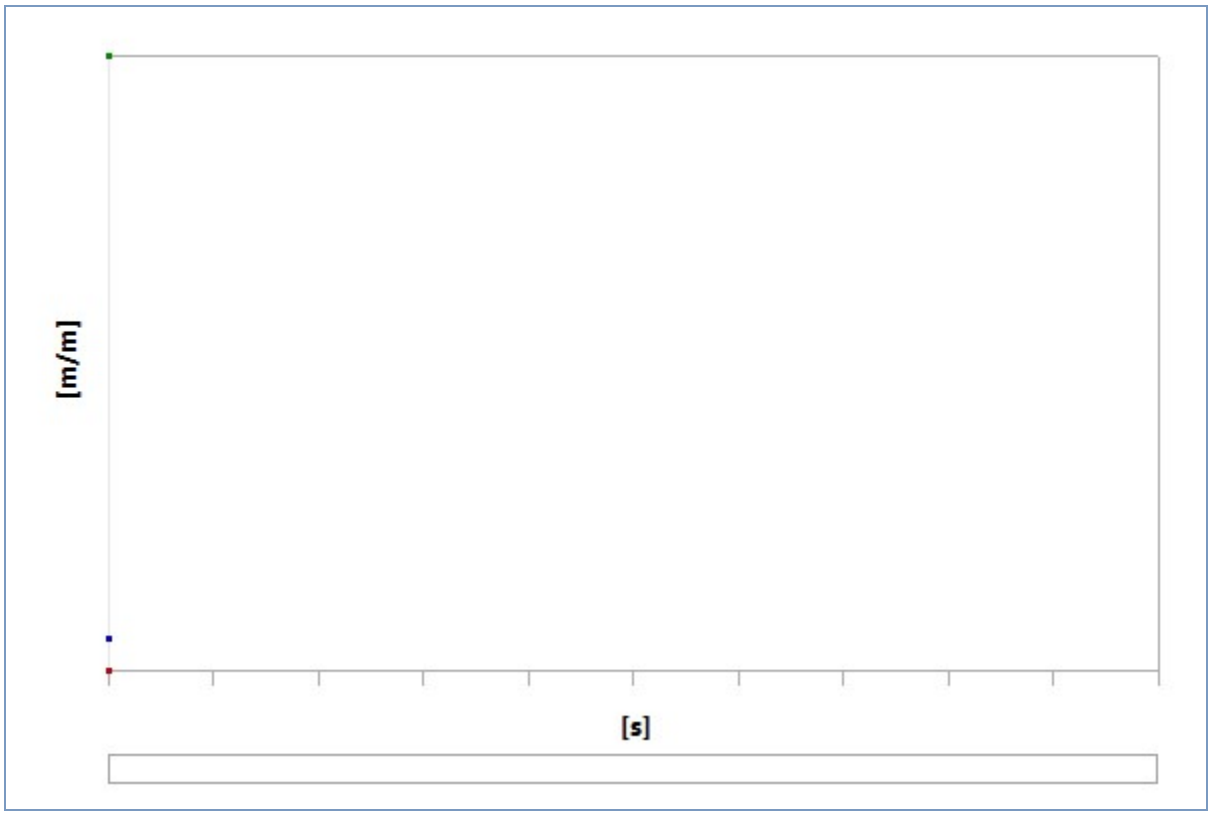


TABLE 17
Model (A4) > Static Structural (A5) > Solution (A6) > Maximum Principal Elastic Strain

Time [s]	Minimum [m/m]	Maximum [m/m]	Average [m/m]
1.	-1.6001e-005	6.3201e-003	3.1973e-004

FIGURE 4
Model (A4) > Static Structural (A5) > Solution (A6) > Maximum Principal Stress

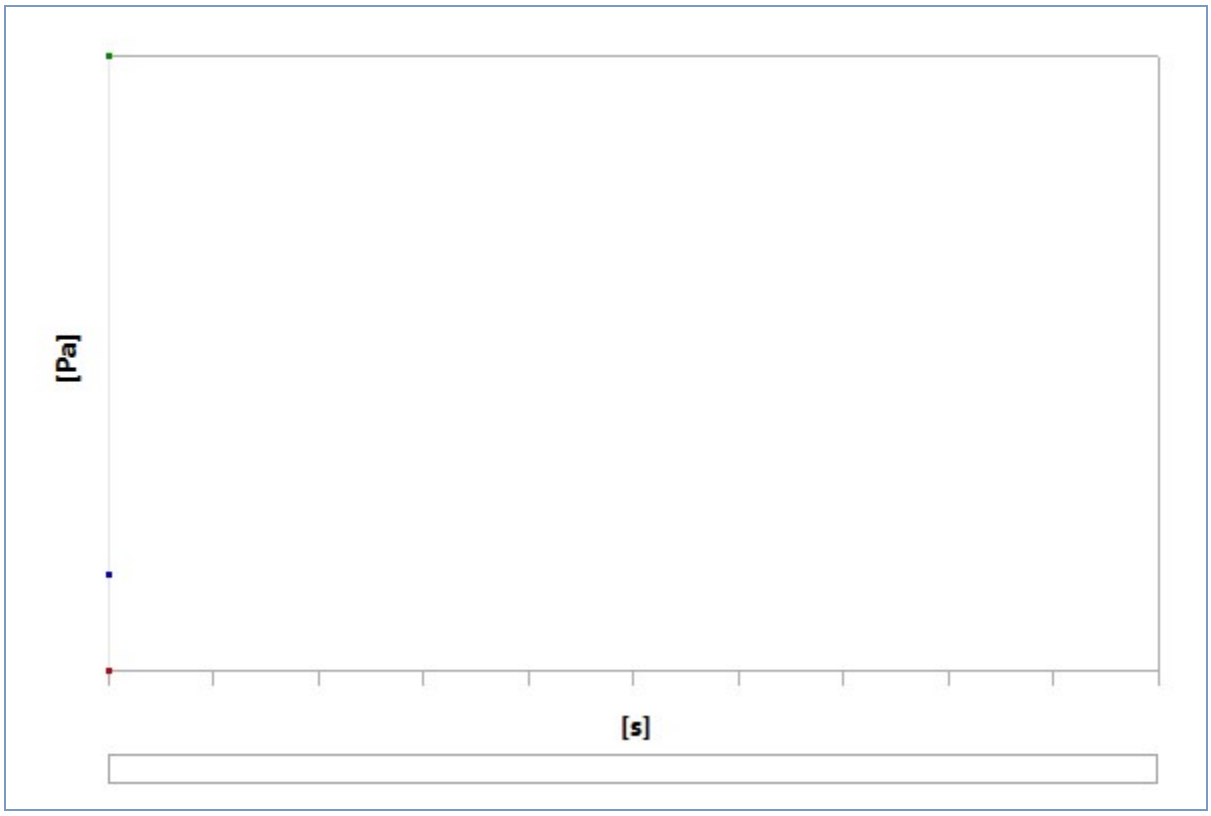


TABLE 18
Model (A4) > Static Structural (A5) > Solution (A6) > Maximum Principal Stress

Time [s]	Minimum [Pa]	Maximum [Pa]	Average [Pa]
1.	-2.1024e+008	1.4128e+009	4.5489e+007

FIGURE 5
Model (A4) > Static Structural (A5) > Solution (A6) > Shear Elastic Strain

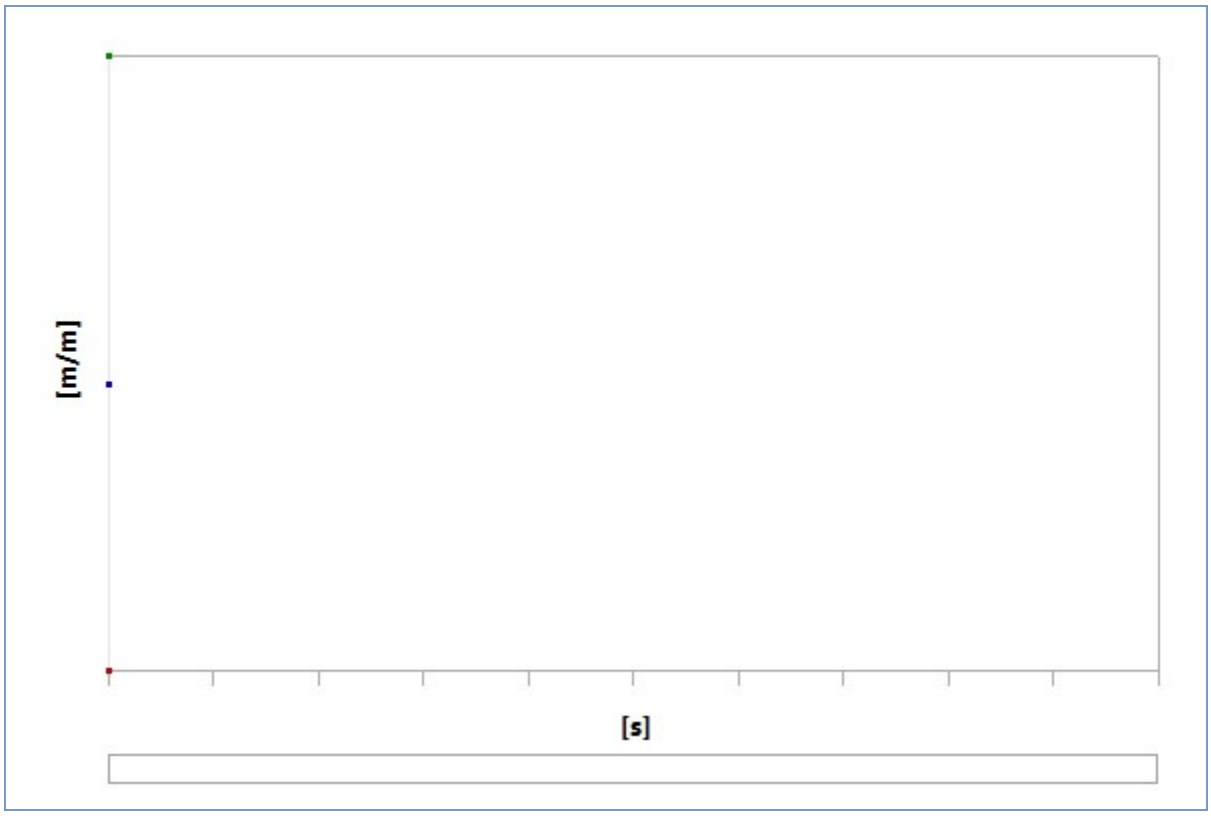


TABLE 19
Model (A4) > Static Structural (A5) > Solution (A6) > Shear Elastic Strain

Time [s]	Minimum [m/m]	Maximum [m/m]	Average [m/m]
1.	-3.1415e-003	3.6197e-003	3.2454e-006

FIGURE 6
Model (A4) > Static Structural (A5) > Solution (A6) > Directional Deformation

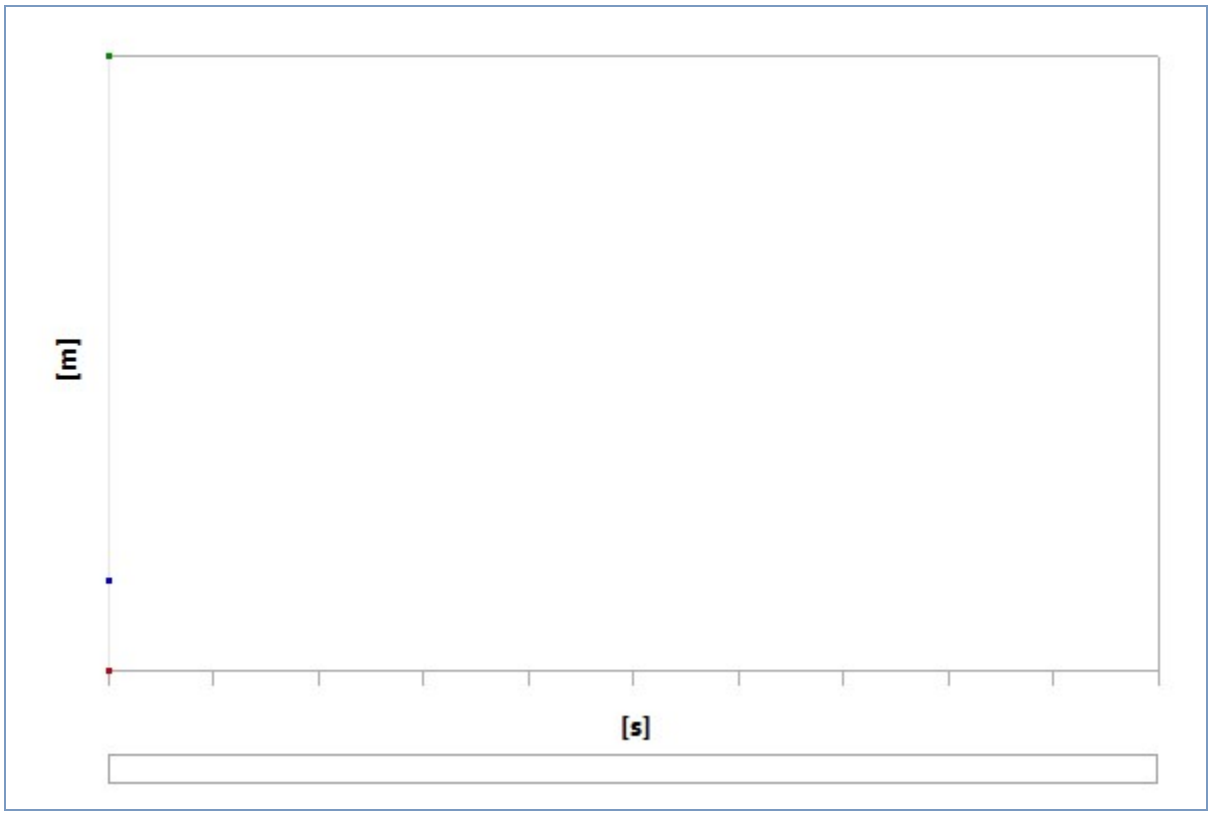


TABLE 20
Model (A4) > Static Structural (A5) > Solution (A6) > Directional Deformation

Time [s]	Minimum [m]	Maximum [m]	Average [m]
1.	0.	1.1043e-002	1.6244e-003

Material Data

AISI4130

TABLE 21
AISI4130 > Constants

Density	7850 kg m^-3

TABLE 22
AISI4130 > Color

Red	Green	Blue
103	192	205

TABLE 23
AISI4130 > Isotropic Elasticity

Temperature C	Young's Modulus Pa	Poisson's Ratio	Bulk Modulus Pa	Shear Modulus Pa
	2.05e+011	0.28	1.553e+011	8.0078e+010

Structural Steel

TABLE 24
Structural Steel > Constants

Density	7850 kg m^-3

Coefficient of Thermal Expansion	1.2e-005 C^-1
Specific Heat	434 J kg^-1 C^-1
Thermal Conductivity	60.5 W m^-1 C^-1
Resistivity	1.7e-007 ohm m

TABLE 25
Structural Steel > Color

Red	Green	Blue
132	139	179

TABLE 26
Structural Steel > Compressive Ultimate Strength

Compressive Ultimate Strength Pa
0

TABLE 27
Structural Steel > Compressive Yield Strength

Compressive Yield Strength Pa
2.5e+008

TABLE 28
Structural Steel > Tensile Yield Strength

Tensile Yield Strength Pa
2.5e+008

TABLE 29
Structural Steel > Tensile Ultimate Strength

Tensile Ultimate Strength Pa
4.6e+008

TABLE 30
Structural Steel > Isotropic Secant Coefficient of Thermal Expansion

Zero-Thermal-Strain Reference Temperature C
22

TABLE 31
Structural Steel > Alternating Stress Mean Stress

Alternating Stress Pa	Cycles	Mean Stress Pa
3.999e+009	10	0
2.827e+009	20	0
1.896e+009	50	0
1.413e+009	100	0
1.069e+009	200	0
4.41e+008	2000	0
2.62e+008	10000	0
2.14e+008	20000	0
1.38e+008	1.e+005	0
1.14e+008	2.e+005	0
8.62e+007	1.e+006	0

TABLE 32
Structural Steel > Strain-Life Parameters

Strength Coefficient Pa	Strength Exponent	Ductility Coefficient	Ductility Exponent	Cyclic Strength Coefficient Pa	Cyclic Strain Hardening Exponent

9.2e+008	-0.106	0.213	-0.47	1.e+009	0.2

TABLE 33
Structural Steel > Isotropic Elasticity

Temperature C	Young's Modulus Pa	Poisson's Ratio	Bulk Modulus Pa	Shear Modulus Pa
	2.e+011	0.3	1.6667e+011	7.6923e+010

TABLE 34
Structural Steel > Isotropic Relative Permeability

Relative Permeability
10000