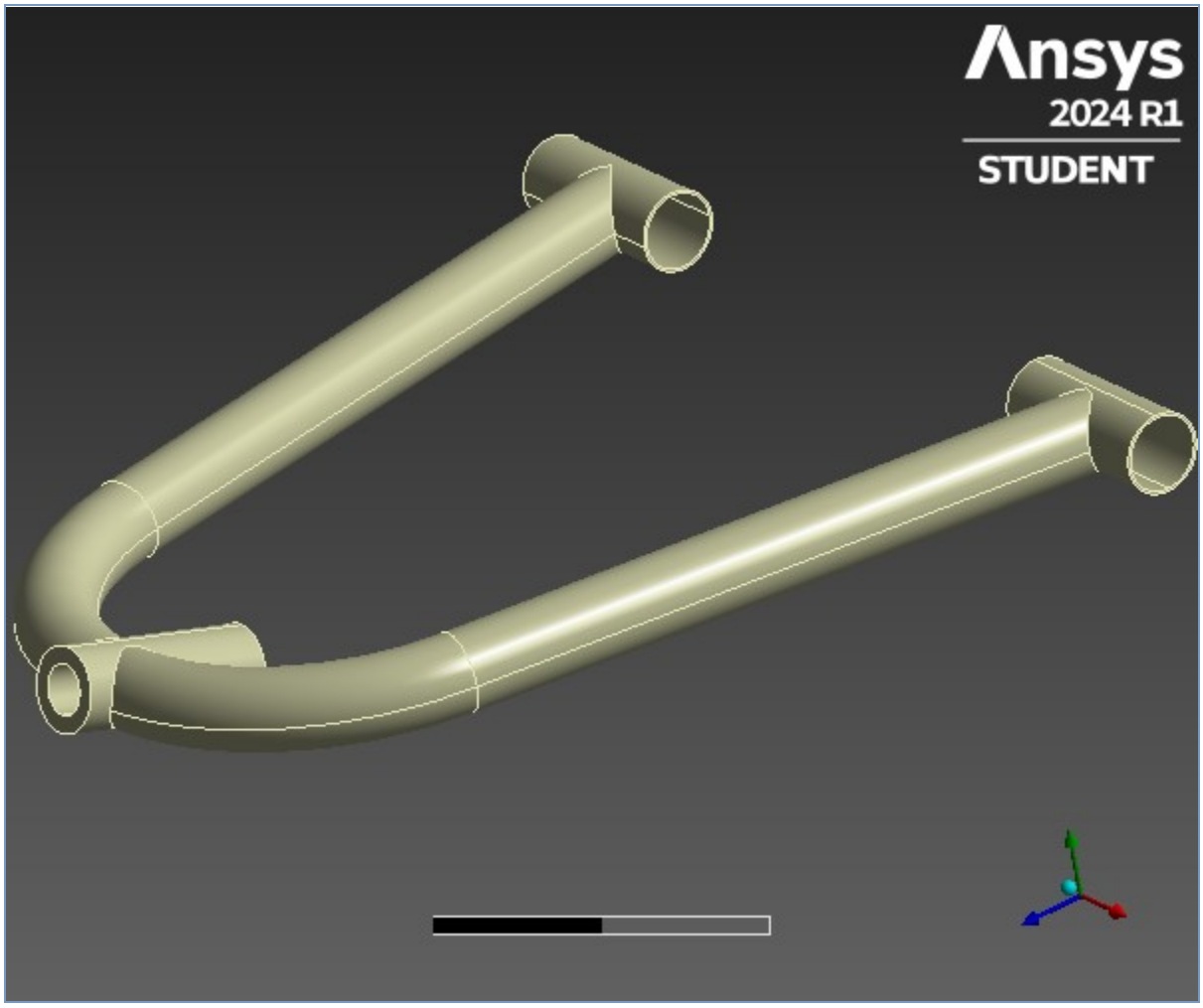
Project*

First Saved	Wednesday, July 3, 2024
Last Saved	Wednesday, July 3, 2024
Product Version	2024 R1
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)

TABLE 2
Model (A4) > Geometry Imports

Object Name	*Geometry Imports*
State	Solved

TABLE 3
Model (A4) > Geometry Imports > Geometry Import (A3)

Object Name	*Geometry Import (A3)*
State	Solved
Definition	
	C:\Users\91982\AppData\Local\Temp\WB_91982_8560_2\wbnew_files\dp0

Source	\SYS\DM\SYS.agdb
Type	DesignModeler
Basic Geometry Options	
Parameters	Independent
Parameter Key	
Advanced Geometry Options	
Compare Parts On Update	No
Analysis Type	3-D

Geometry

TABLE 4
Model (A4) > Geometry

Object Name	*Geometry*
State	Fully Defined
Definition	
Source	C:\Users\91982\AppData\Local\Temp\WB_91982_8560_2\wbnew_files\dp0 \SYS\DM\SYS.agdb
Type	DesignModeler
Length Unit	Meters
Element Control	Program Controlled
Display Style	Body Color
Bounding Box	
Length X	0.3 m
Length Y	4.5318e-002 m
Length Z	0.31658 m
Properties	
Volume	7.5504e-005 m³
Mass	0.59271 kg
Scale Factor Value	1.
Statistics	
Bodies	1
Active Bodies	1
Nodes	35838
Elements	18080
Mesh Metric	None
Update Options	
Assign Default Material	No
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
Import Facet Quality	Source
Clean Bodies On Import	No
Stitch Surfaces On Import	None
Decompose Disjoint Geometry	Yes
Enclosure and Symmetry Processing	Yes

TABLE 5
Model (A4) > Geometry > Parts

Object Name	*Solid*
State	Meshed
Graphics Properties	
Visible	Yes
Transparency	1
Definition	
Suppressed	No
Stiffness Behavior	Flexible
Coordinate System	Default Coordinate System
Reference Temperature	By Environment
Treatment	None
Material	
Assignment	chromoly
Nonlinear Effects	Yes
Thermal Strain Effects	Yes
Bounding Box	
Length X	0.3 m
Length Y	4.5318e-002 m
Length Z	0.31658 m
Properties	
Volume	7.5504e-005 m³
Mass	0.59271 kg
Centroid X	0.16058 m
Centroid Y	-1.2119e-003 m
Centroid Z	0.17672 m
Moment of Inertia Ip1	6.2926e-003 kg·m²
Moment of Inertia Ip2	9.9132e-003 kg·m²
Moment of Inertia Ip3	3.7169e-003 kg·m²
Statistics	
Nodes	35838
Elements	18080
Mesh Metric	None

TABLE 6
Model (A4) > Materials

Object Name	*Materials*
State	Fully Defined
Statistics	
Materials	2

Material Assignments	0

Coordinate Systems

TABLE 7
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.]
Transfer Properties	
Source	
Read Only	No

Connections

TABLE 8
Model (A4) > Connections

Object Name	*Connections*
State	Fully Defined
Auto Detection	
Generate Automatic Connection On Refresh	Yes
Transparency	
Enabled	Yes
Statistics	
Contacts	0
Active Contacts	0
Joints	0
Active Joints	0
Beams	0
Active Beams	0
Bearings	0
Active Bearings	0
Springs	0
Active Springs	0
Body Interactions	0
Active Body Interactions	0

TABLE 9
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	1.0962e-003 m
Use Range	No
Face/Face	Yes
Face-Face Angle Tolerance	75. °
Face Overlap Tolerance	Off
Cylindrical Faces	Include
Face/Edge	No
Edge/Edge	No
Priority	Include All
Group By	Bodies
Search Across	Bodies
Statistics	
Connections	0
Active Connections	0

Mesh

TABLE 10
Model (A4) > Mesh

Object Name	*Mesh*
State	Solved
Display	
Display Style	Use Geometry Setting
Defaults	
Physics Preference	Mechanical
Element Order	Program Controlled
Element Size	Default
Sizing	
Use Adaptive Sizing	Yes
Resolution	Default (2)
Mesh Defeaturing	Yes
Defeature Size	Default
Transition	Fast
Span Angle Center	Coarse
Initial Size Seed	Assembly
Bounding Box Diagonal	0.4385 m
Average Surface Area	2.4554e-003 m²
Minimum Edge Length	3.0393e-003 m
Quality	
Check Mesh Quality	Mesh Quality Worksheet
Error Limits	Standard Mechanical
Target Element Quality	Default (5.e-002)
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
Inflation Element Type	Wedges
View Advanced Options	No
Advanced	
Number of CPUs for Parallel Part Meshing	Program Controlled
Straight Sided Elements	No
Rigid Body Behavior	Dimensionally Reduced
Triangle Surface Mesher	Program Controlled
Topology Checking	Yes
Pinch Tolerance	Please Define
Generate Pinch on Refresh	No
Statistics	
Nodes	35838
Elements	18080
Show Detailed Statistics	No

TABLE 11
Model (A4) > Mesh > Mesh Controls

Object Name	*Face Sizing*
State	Fully Defined
Scope	
Scoping Method	Geometry Selection
Geometry	51 Faces
Definition	
Suppressed	No
Type	Element Size
Element Size	5.e-003 m
Advanced	
Defeature Size	Default
Influence Volume	No
Behavior	Soft

Static Structural (A5)

TABLE 12
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 13

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
Quasi-Static Solution	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	Program Controlled
Advanced	
Inverse Option	No
Contact Split (DMP)	Program Controlled
Output Controls	
Stress	Yes
Back Stress	No
Strain	Yes
Contact Data	Yes
Nonlinear Data	No
Nodal Forces	No
Volume and Energy	Yes
Euler Angles	Yes
General Miscellaneous	No
Contact Miscellaneous	No
Store Results At	All Time Points
Result File Compression	Program Controlled
Analysis Data Management	
Solver Files Directory	C:\Users\91982\AppData\Local\Temp\WB_91982_8560_2\wbnew_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

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

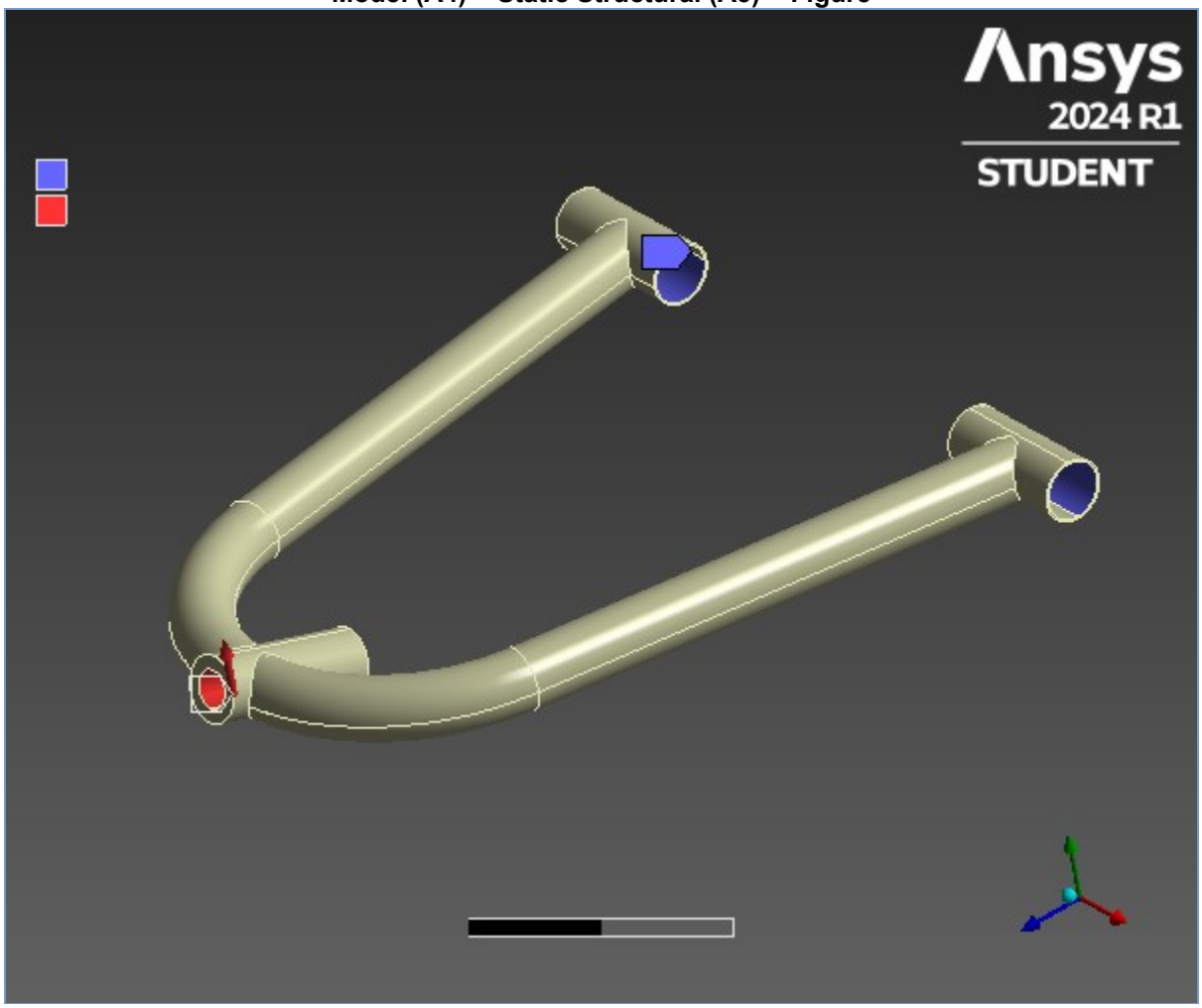
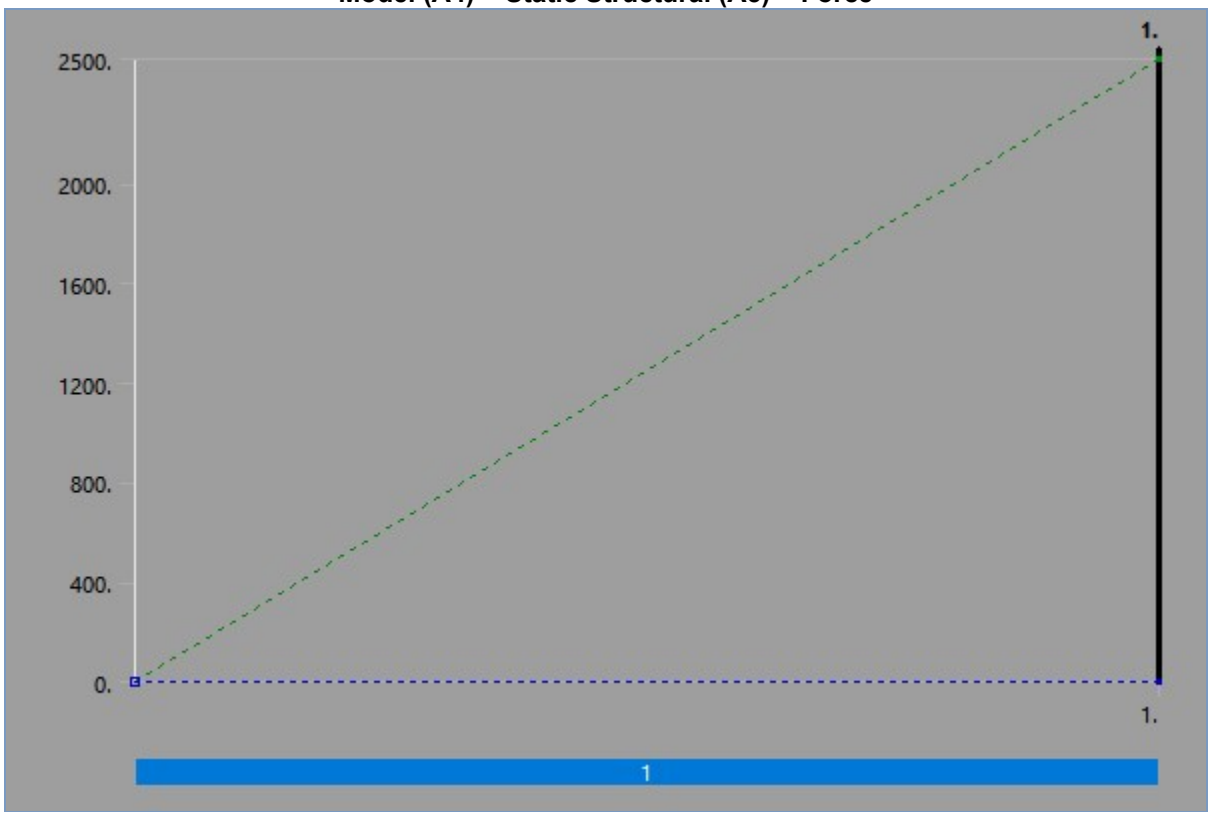


TABLE 14
Model (A4) > Static Structural (A5) > Loads

Object Name	*Fixed Support*	*Force*
State	Fully Defined	
Scope		
Scoping Method	Geometry Selection	
Geometry	2 Faces	1 Face
Definition		
Type	Fixed Support	Force
Suppressed	No	
Define By		Components
Applied By		Surface Effect
Coordinate System		Global Coordinate System
X Component		0. N (ramped)
Y Component		2500. N (ramped)
Z Component		0. N (ramped)

FIGURE 2
Model (A4) > Static Structural (A5) > Force



Solution (A6)

TABLE 15
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	5. s
MAPDL Memory Used	544. MB
MAPDL Result File Size	11.688 MB
Post Processing	
Beam Section Results	No
On Demand Stress/Strain	No

TABLE 16
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 17
Model (A4) > Static Structural (A5) > Solution (A6) > Results

Object Name	*Total Deformation*	*Equivalent Elastic Strain*	*Equivalent Stress*
State	Solved		
Scope			
Scoping Method	Geometry Selection		
Geometry	All Bodies		
Definition			
Type	Total Deformation	Equivalent Elastic Strain	Equivalent (von-Mises) Stress
By	Time		
Display Time	Last		
Separate Data by Entity	No		
Calculate Time History	Yes		
Identifier			
Suppressed	No		
Results			
Minimum	0. m	1.9652e-010 m/m	18.424 Pa
Maximum	1.1194e-002 m	9.9892e-003 m/m	1.4869e+009 Pa
Average	4.2405e-003 m	1.1647e-003 m/m	2.1422e+008 Pa
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 3
Model (A4) > Static Structural (A5) > Solution (A6) > Total Deformation

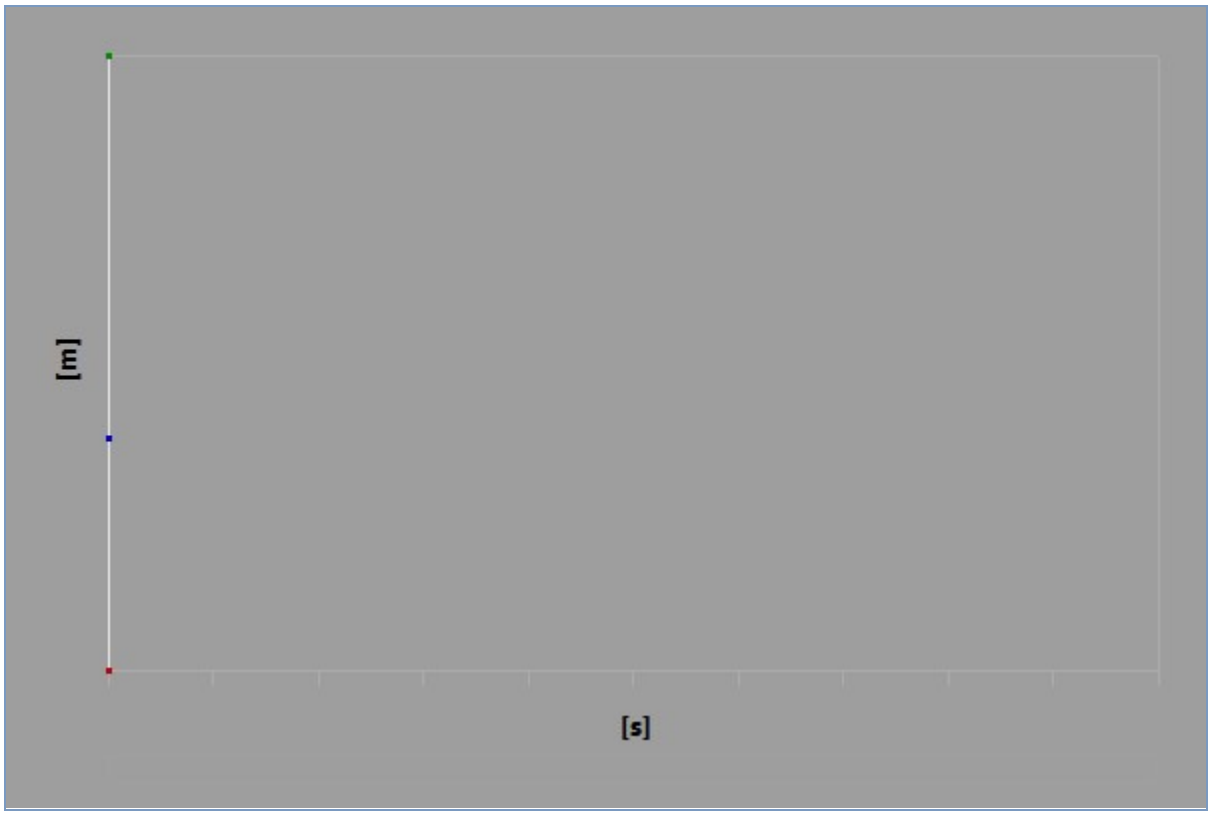


TABLE 18
Model (A4) > Static Structural (A5) > Solution (A6) > Total Deformation

Time [s]	Minimum [m]	Maximum [m]	Average [m]
1.	0.	1.1194e-002	4.2405e-003

FIGURE 4
Model (A4) > Static Structural (A5) > Solution (A6) > Total Deformation > Figure

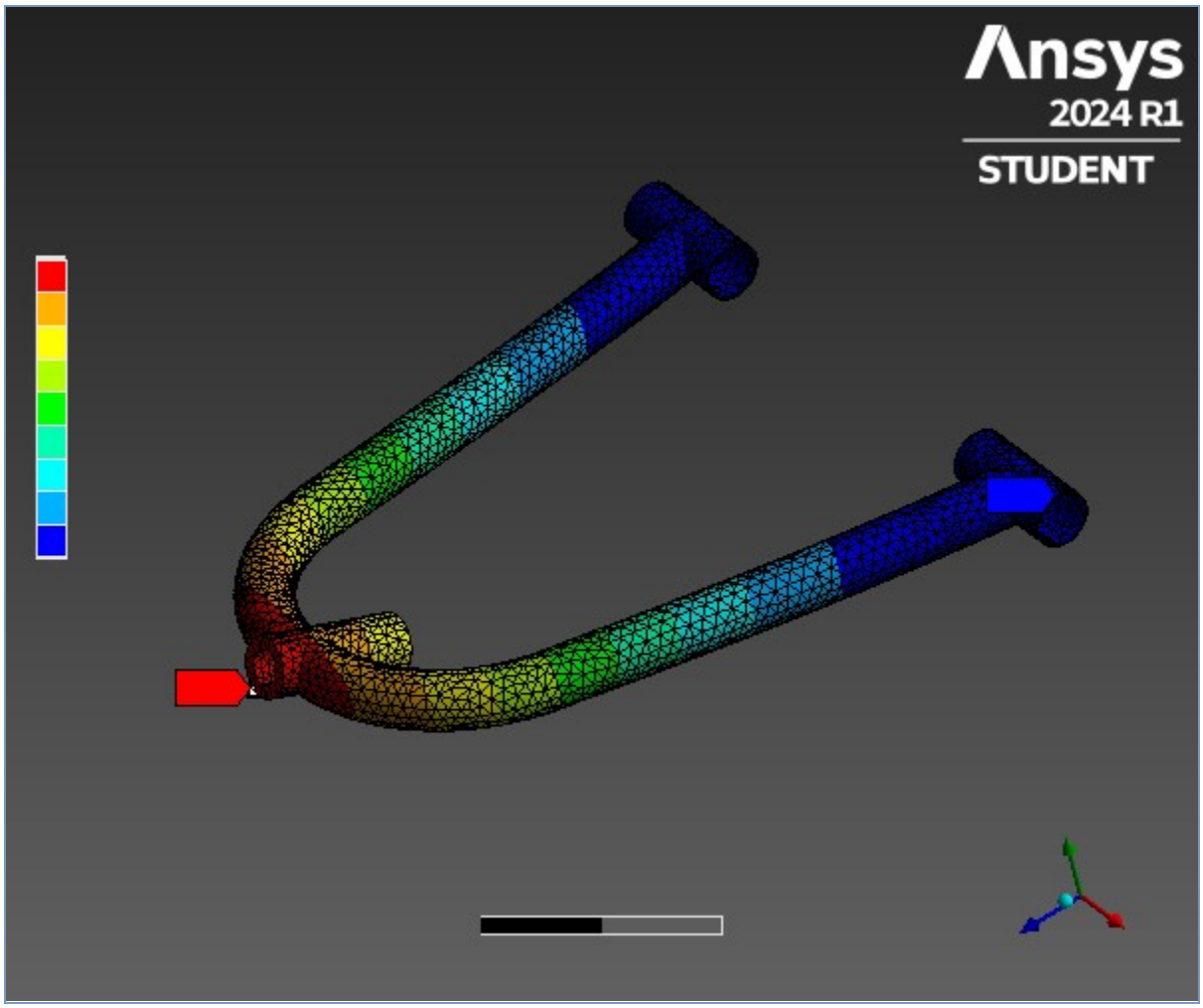


FIGURE 5
Model (A4) > Static Structural (A5) > Solution (A6) > Equivalent Elastic Strain

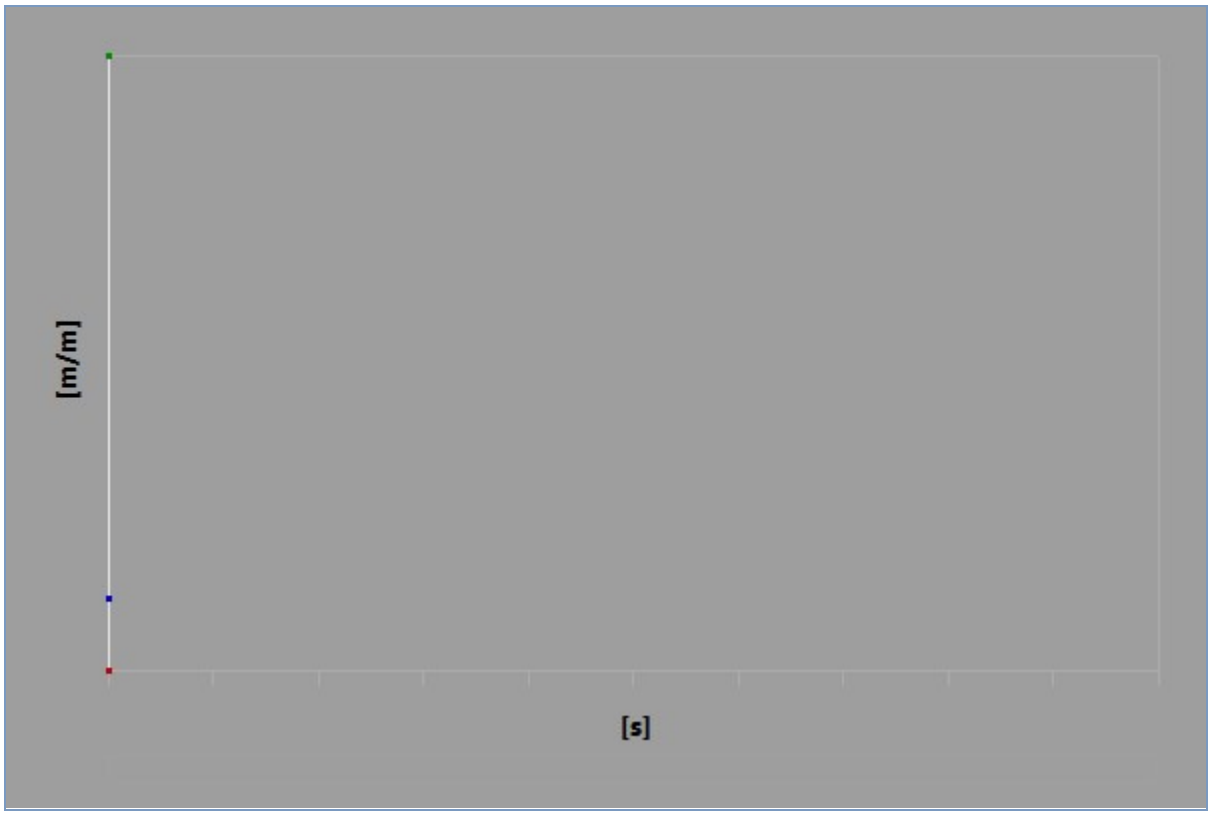


TABLE 19
Model (A4) > Static Structural (A5) > Solution (A6) > Equivalent Elastic Strain

Time [s]	Minimum [m/m]	Maximum [m/m]	Average [m/m]
1.	1.9652e-010	9.9892e-003	1.1647e-003

FIGURE 6
Model (A4) > Static Structural (A5) > Solution (A6) > Equivalent Elastic Strain > Figure

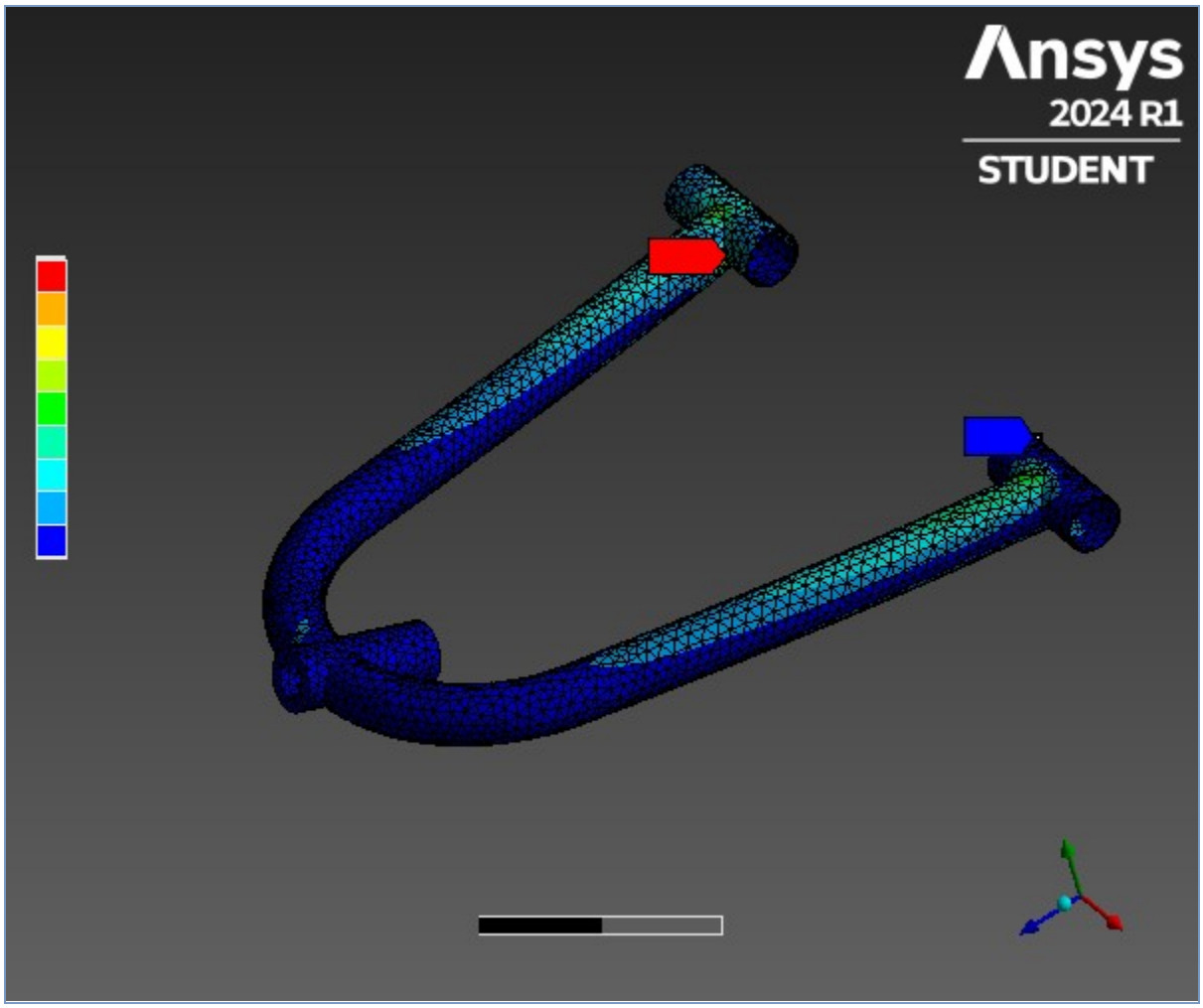


FIGURE 7
Model (A4) > Static Structural (A5) > Solution (A6) > Equivalent Stress

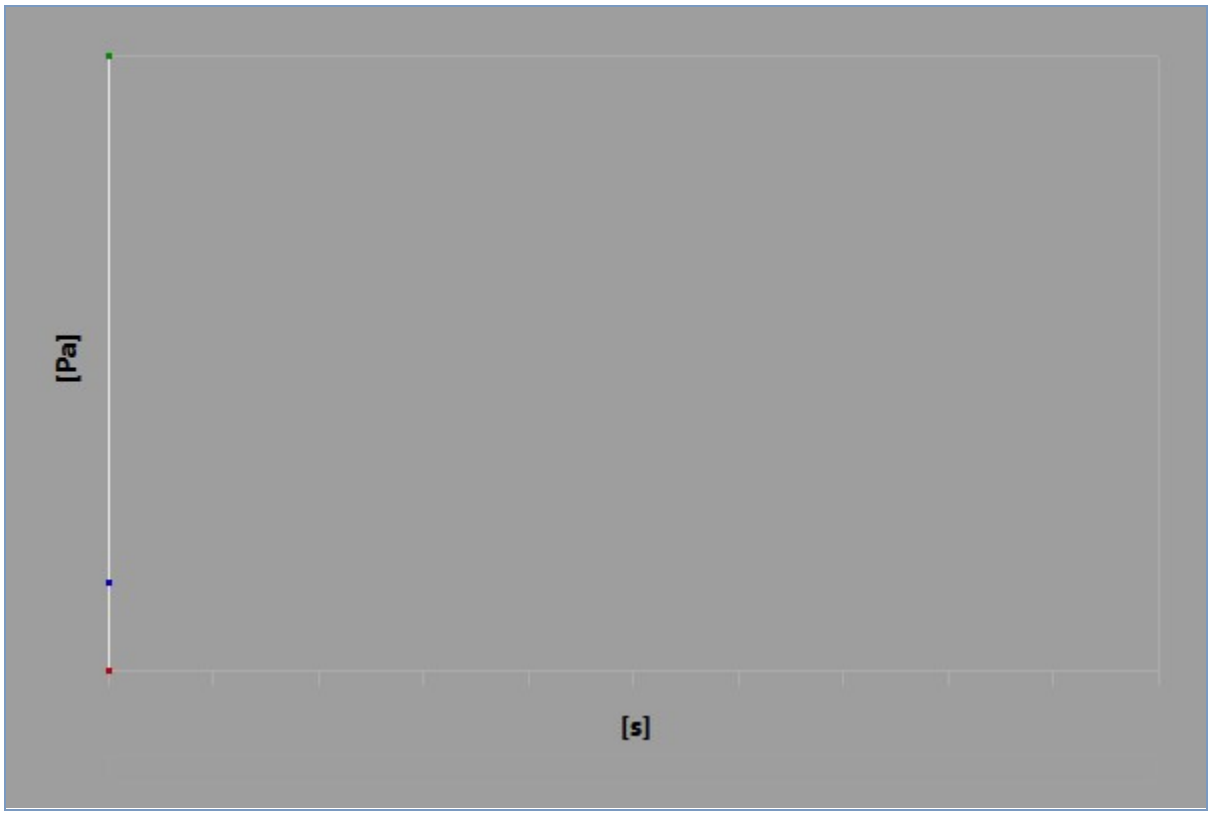


TABLE 20
Model (A4) > Static Structural (A5) > Solution (A6) > Equivalent Stress

Time [s]	Minimum [Pa]	Maximum [Pa]	Average [Pa]
1.	18.424	1.4869e+009	2.1422e+008

FIGURE 8
Model (A4) > Static Structural (A5) > Solution (A6) > Equivalent Stress > Figure

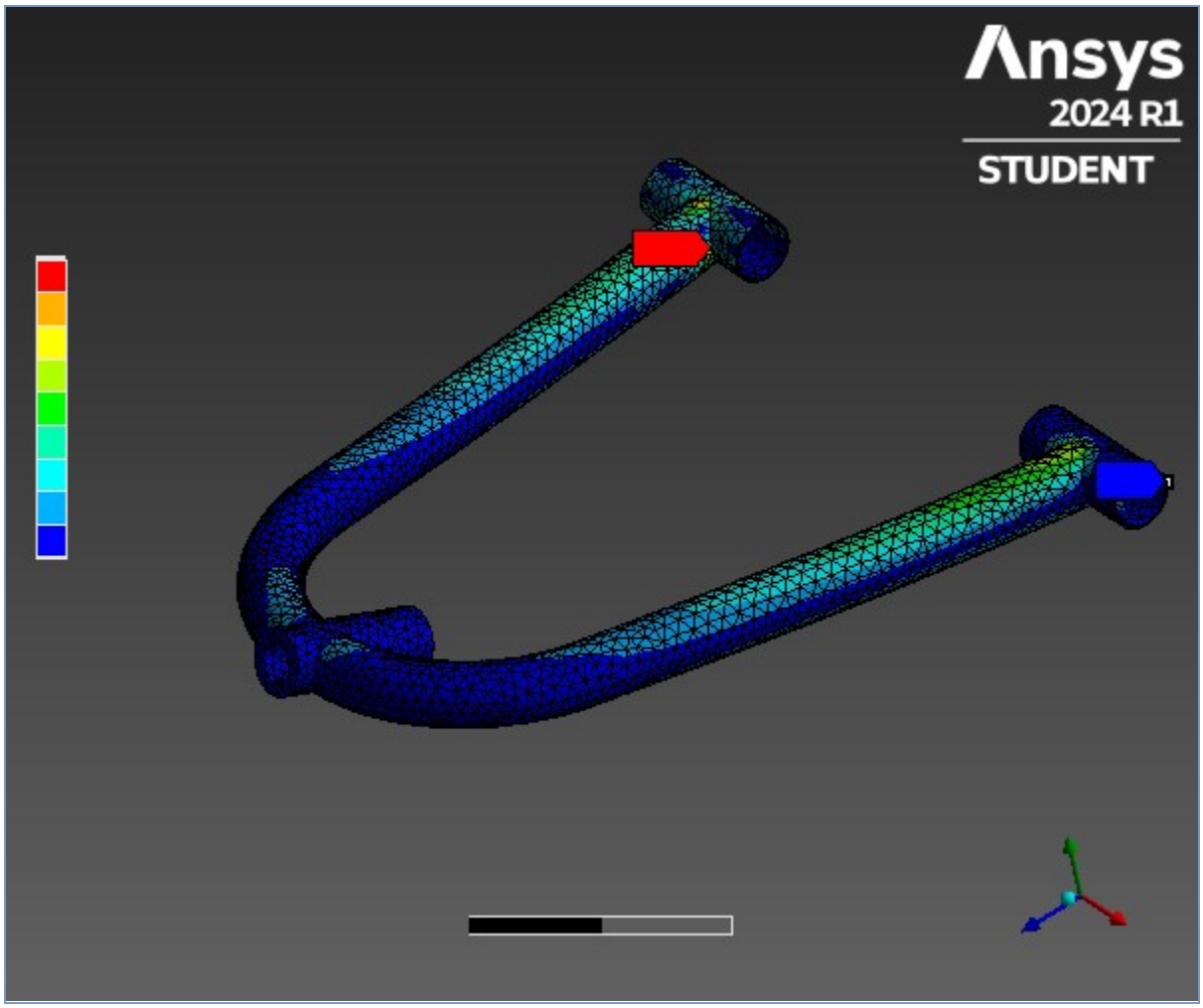


TABLE 21
Model (A4) > Static Structural (A5) > Solution (A6) > Stress Safety Tools

Object Name	*Stress Tool*
State	Solved
Definition	
Theory	Max Equivalent Stress
Stress Limit Type	Tensile Yield Per Material

TABLE 22
Model (A4) > Static Structural (A5) > Solution (A6) > Stress Tool > Results

Object Name	*Safety Factor*	*Safety Margin*
State	Solved	
Scope		
Scoping Method	Geometry Selection	
Geometry	All Bodies	
Definition		
Type	Safety Factor	Safety Margin
By	Time	
Display Time	Last	
Separate Data by Entity	No	
Calculate Time History	Yes	
Identifier		
Suppressed	No	

Integration Point Results		
Display Option	Averaged	
Average Across Bodies	No	
Results		
Minimum	0.48423	-0.51577
Minimum Occurs On	Solid	
Information		
Time	1. s	
Load Step	1	
Substep	1	
Iteration Number	1	

FIGURE 9
Model (A4) > Static Structural (A5) > Solution (A6) > Stress Tool > Safety Factor

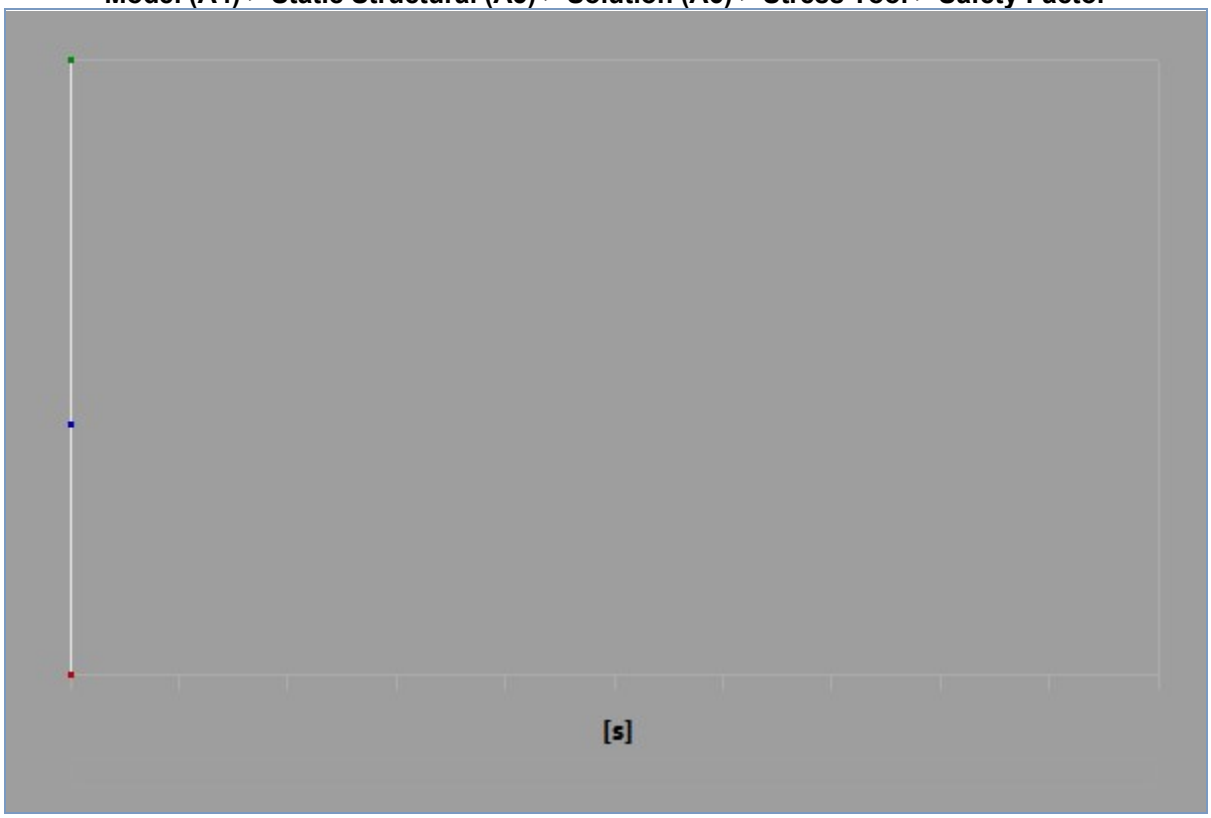


TABLE 23
Model (A4) > Static Structural (A5) > Solution (A6) > Stress Tool > Safety Factor

Time [s]	Minimum	Maximum	Average
1.	0.48423	15.	6.4163

FIGURE 10
Model (A4) > Static Structural (A5) > Solution (A6) > Stress Tool > Safety Factor > Figure

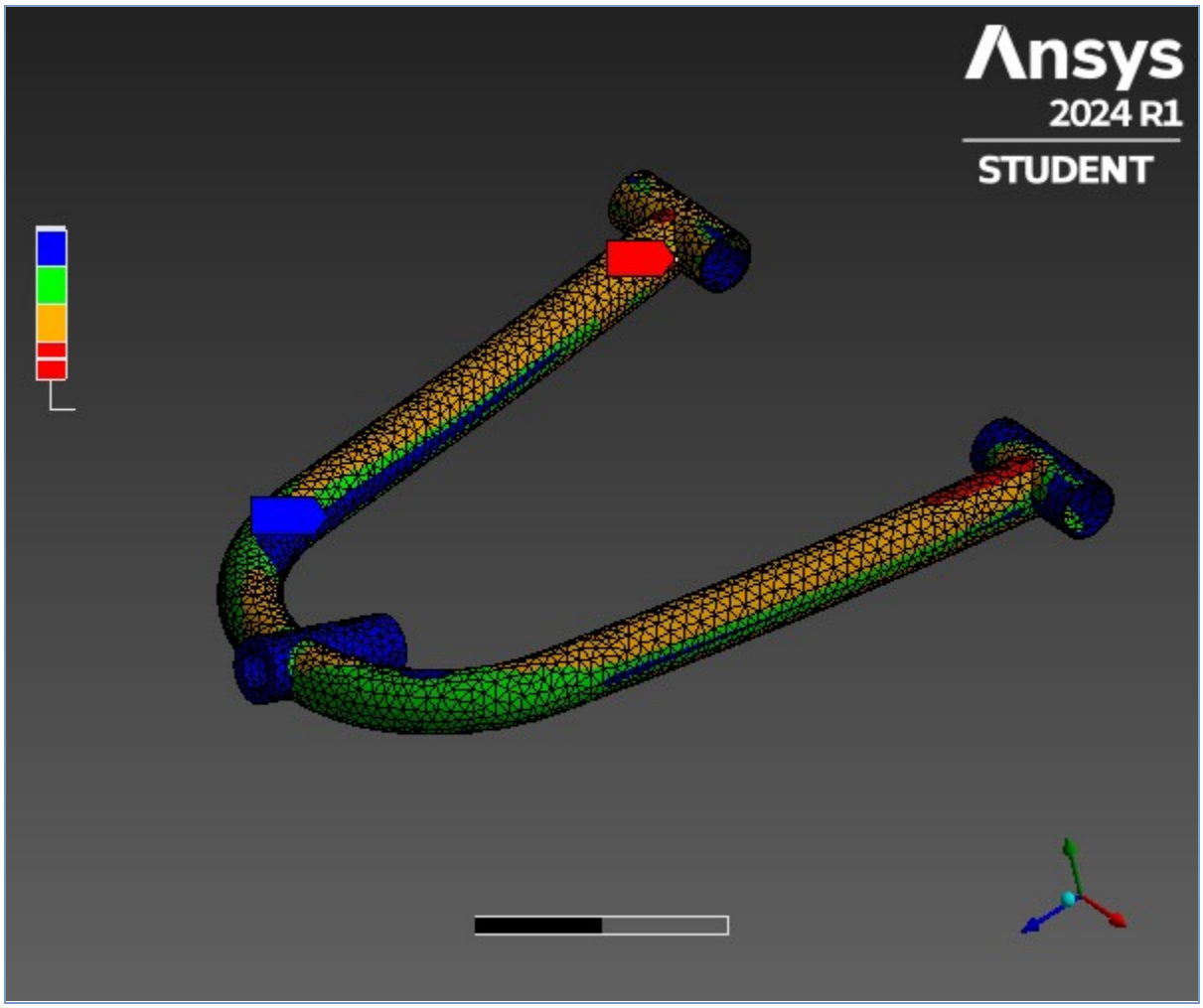


FIGURE 11
Model (A4) > Static Structural (A5) > Solution (A6) > Stress Tool > Safety Margin

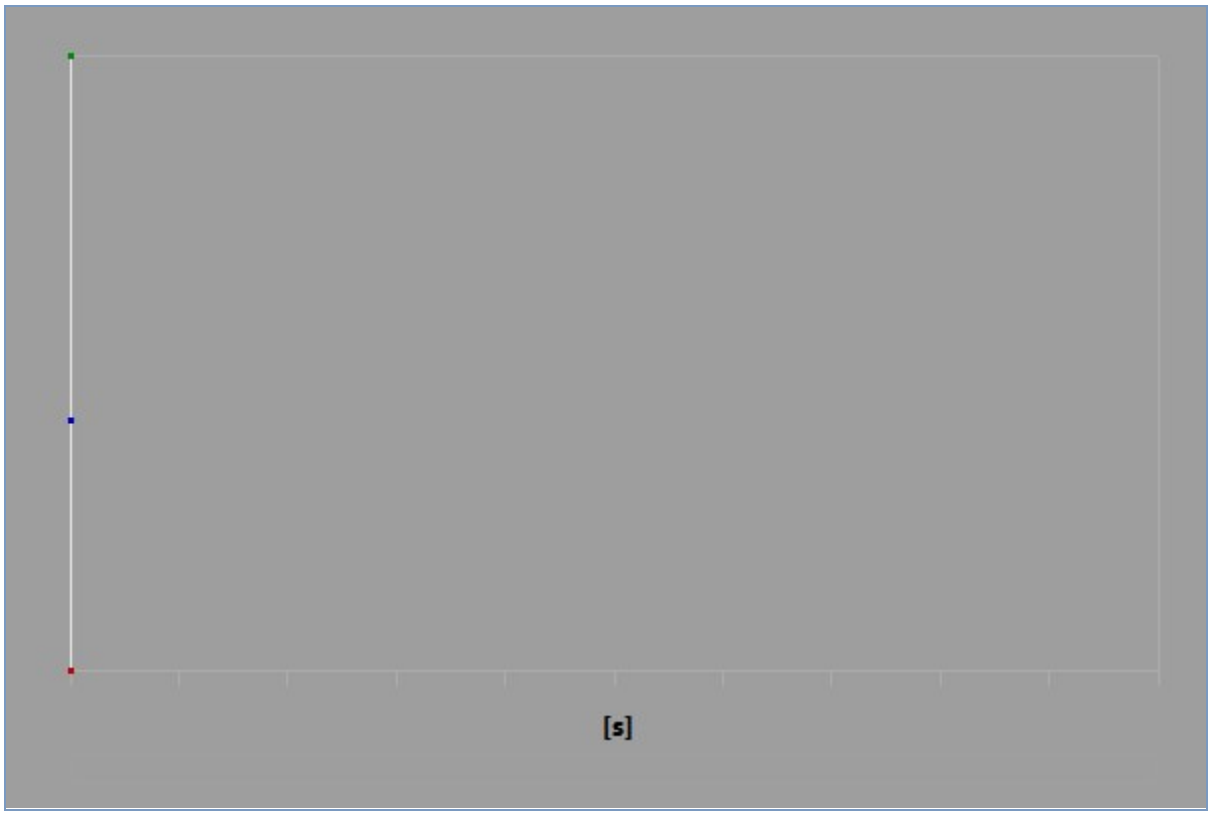


TABLE 24
Model (A4) > Static Structural (A5) > Solution (A6) > Stress Tool > Safety Margin

Time [s]	Minimum	Maximum	Average
1.	-0.51577	14.	5.4163

FIGURE 12
Model (A4) > Static Structural (A5) > Solution (A6) > Stress Tool > Safety Margin > Figure

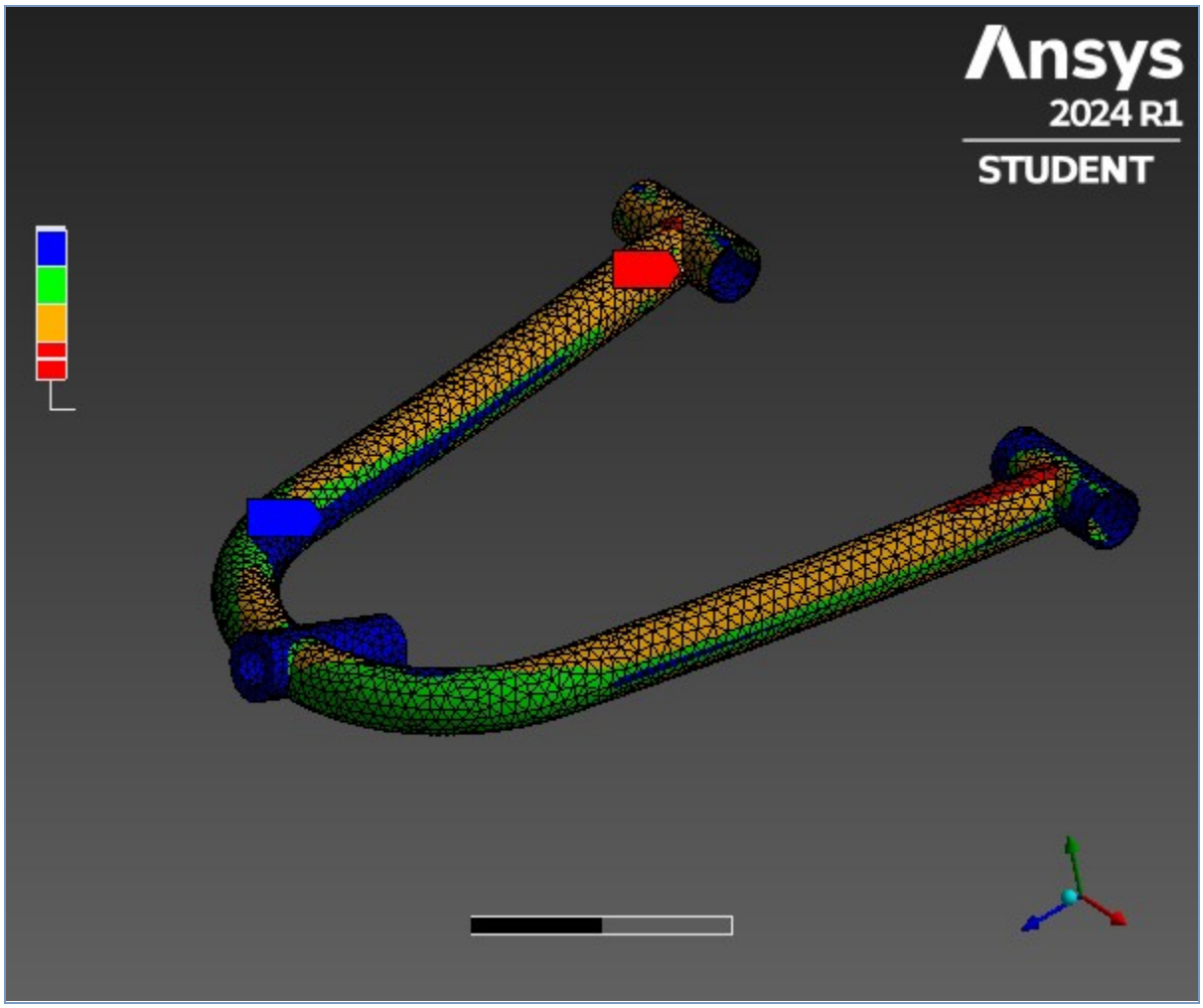


TABLE 25
Model (A4) > Static Structural (A5) > Solution (A6) > Stress Safety Tools

Object Name	*Stress Tool 2*
State	Solved
Definition	
Theory	Max Shear Stress
Factor	0.5
Stress Limit Type	Tensile Yield Per Material

TABLE 26
Model (A4) > Static Structural (A5) > Solution (A6) > Stress Tool 2 > Results

Object Name	*Safety Factor*	*Safety Margin*
State	Solved	
Scope		
Scoping Method	Geometry Selection	
Geometry	All Bodies	
Definition		
Type	Safety Factor	Safety Margin
By	Time	
Display Time	Last	
Separate Data by Entity	No	
Calculate Time History	Yes	
Identifier		

Suppressed	No	
Integration Point Results		
Display Option	Averaged	
Average Across Bodies	No	
Results		
Minimum	0.45835	-0.54165
Minimum Occurs On	Solid	
Information		
Time	1. s	
Load Step	1	
Substep	1	
Iteration Number	1	

FIGURE 13
Model (A4) > Static Structural (A5) > Solution (A6) > Stress Tool 2 > Safety Factor

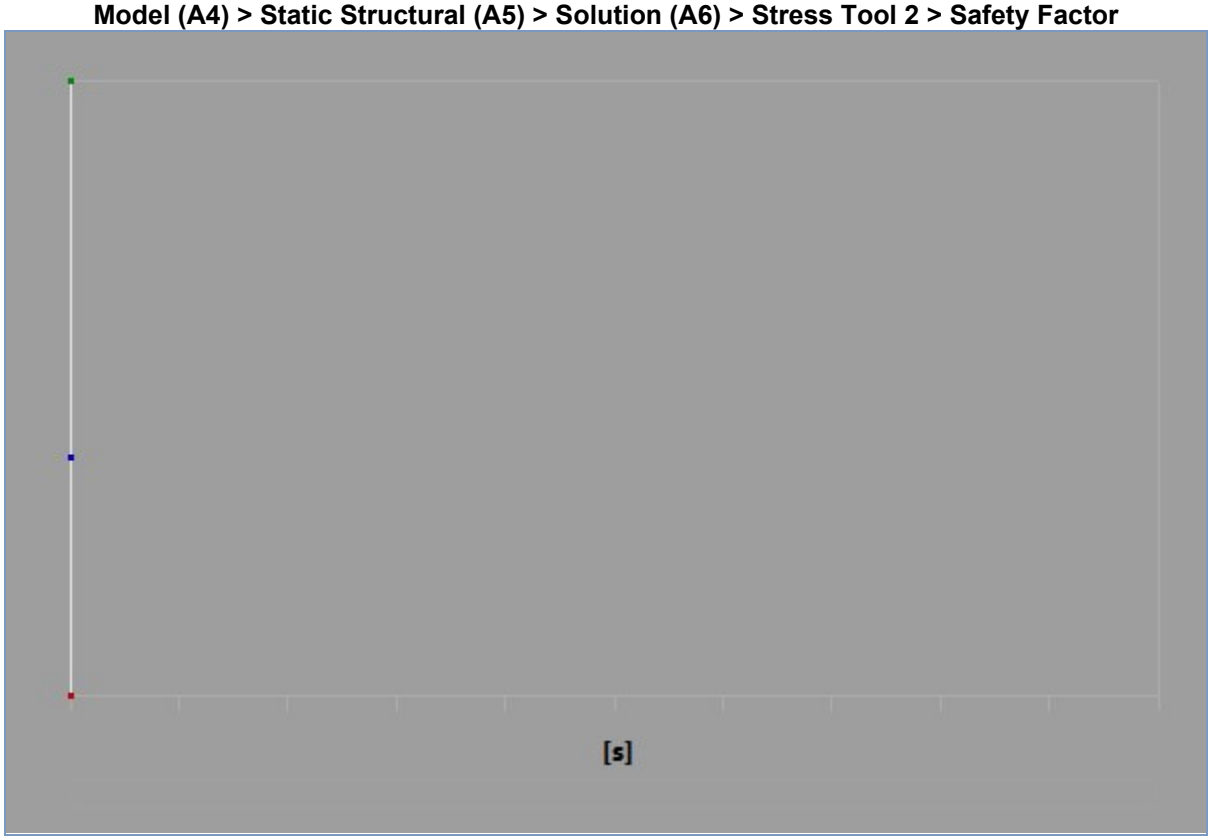


TABLE 27
Model (A4) > Static Structural (A5) > Solution (A6) > Stress Tool 2 > Safety Factor

Time [s]	Minimum	Maximum	Average
1.	0.45835	15.	6.107

FIGURE 14
Model (A4) > Static Structural (A5) > Solution (A6) > Stress Tool 2 > Safety Factor > Figure

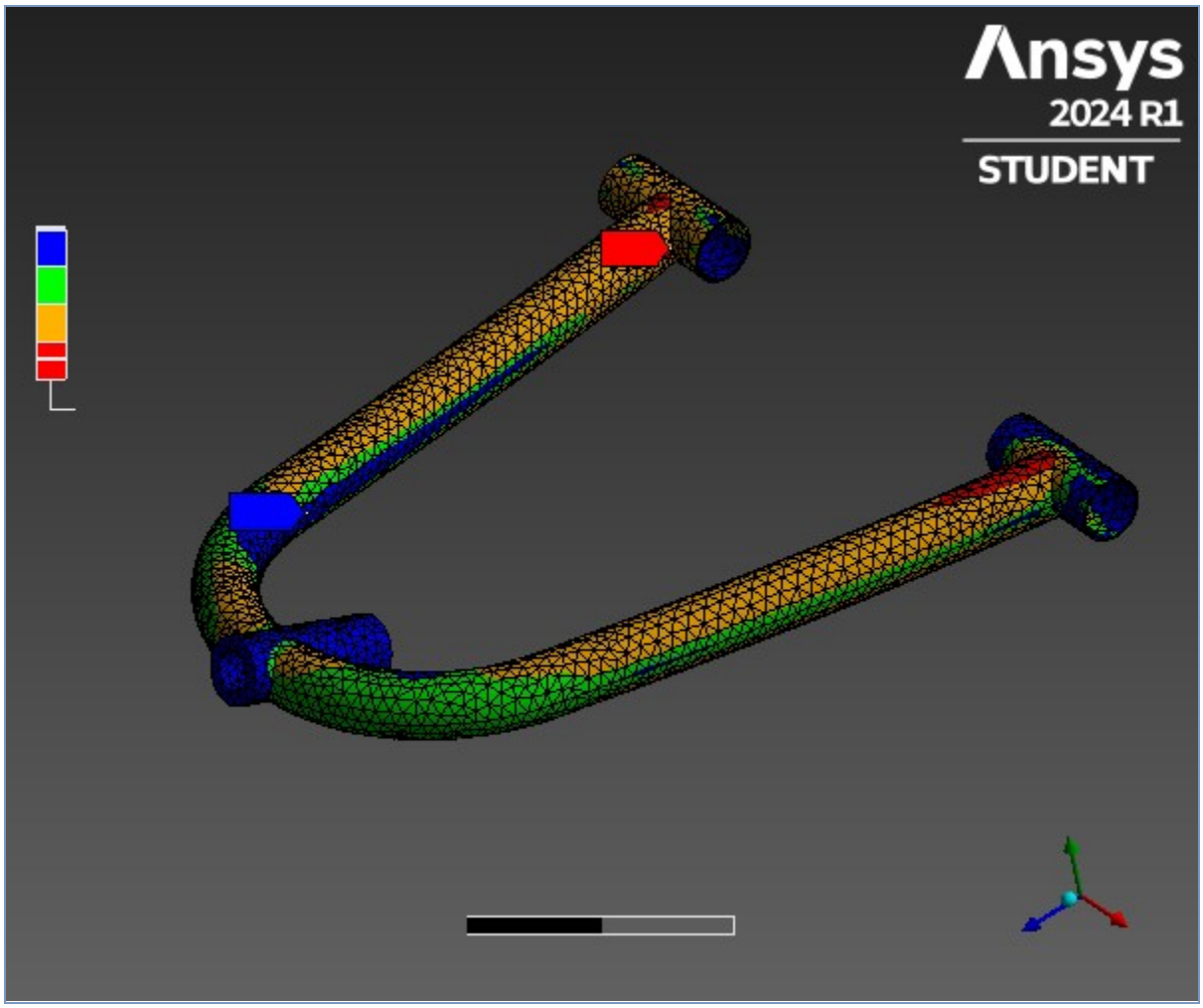


FIGURE 15
Model (A4) > Static Structural (A5) > Solution (A6) > Stress Tool 2 > Safety Margin

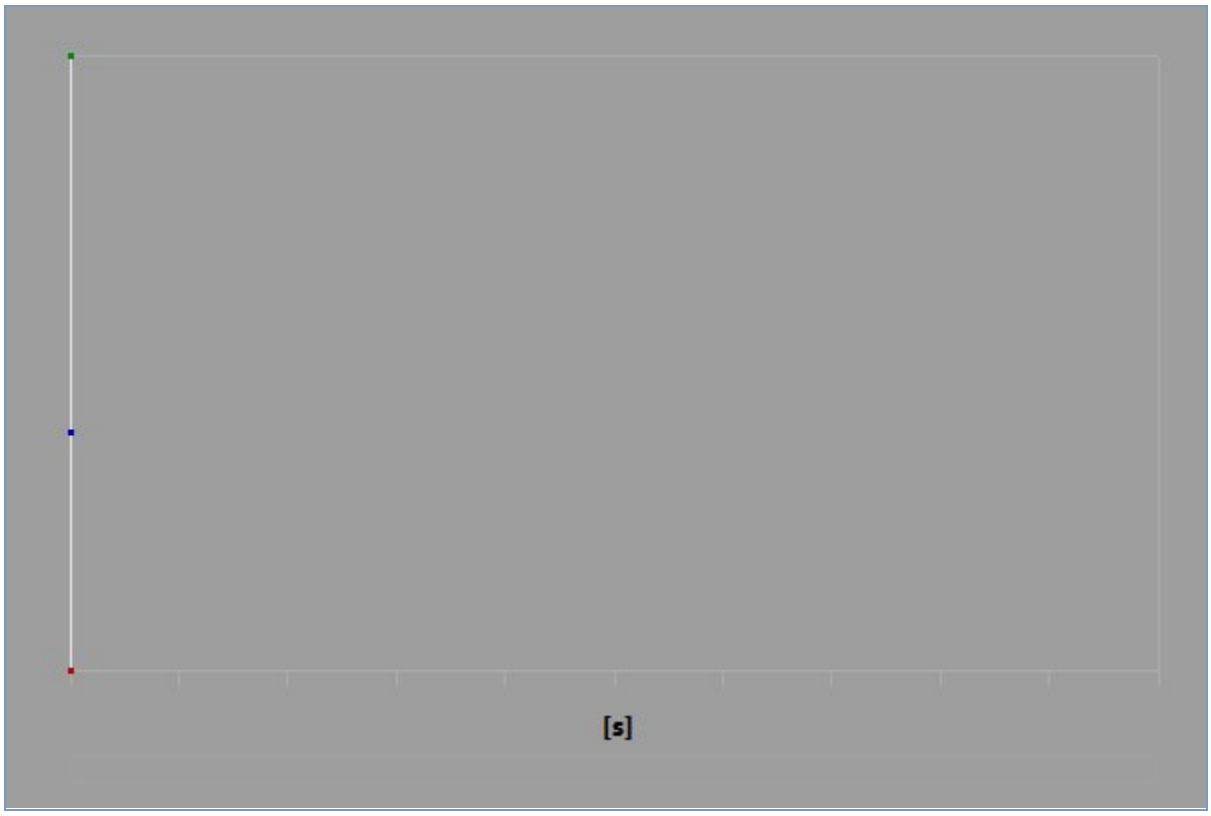
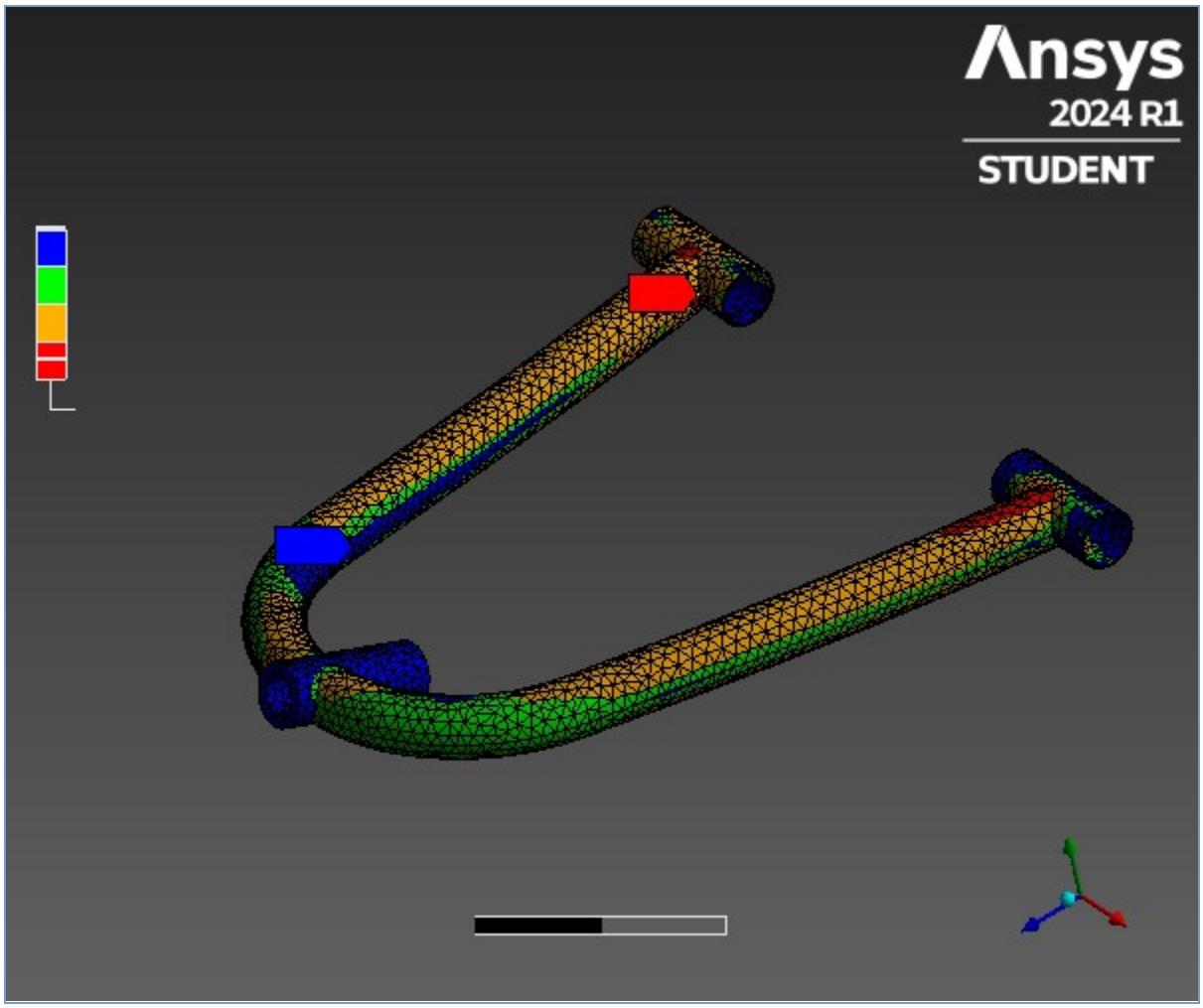


TABLE 28
Model (A4) > Static Structural (A5) > Solution (A6) > Stress Tool 2 > Safety Margin

Time [s]	Minimum	Maximum	Average
1.	-0.54165	14.	5.107

FIGURE 16
Model (A4) > Static Structural (A5) > Solution (A6) > Stress Tool 2 > Safety Margin > Figure



Material Data

chromoly

TABLE 29
chromoly > Constants

Density	7850 kg m^-3
Coefficient of Thermal Expansion	1.12e+007 C^-1

TABLE 30
chromoly > Color

Red	Green	Blue
103	192	205

TABLE 31
chromoly > Isotropic Elasticity

Young's Modulus Pa	Poisson's Ratio	Bulk Modulus Pa	Shear Modulus Pa	Temperature C
2.056e+011	0.285	1.5938e+011	8.e+010	

TABLE 32
chromoly > Tensile Yield Strength

Tensile Yield Strength Pa

7.2e+008

TABLE 33
chromoly > Tensile Ultimate Strength

Tensile Ultimate Strength Pa
8.4e+008