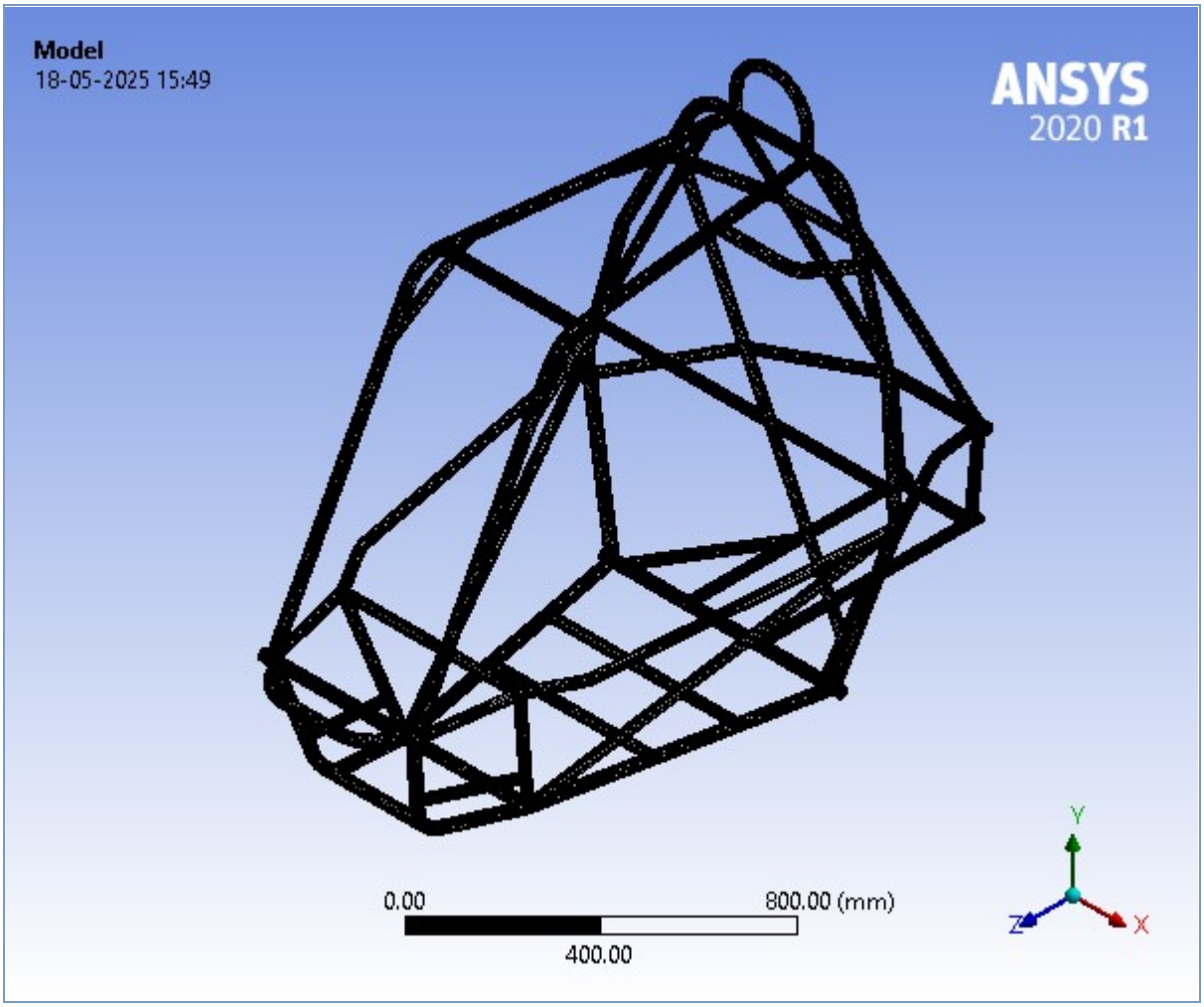
Project*

First Saved	Sunday, May 18, 2025
Last Saved	Sunday, May 18, 2025
Product Version	2020 R1
Save Project Before Solution	No
Save Project After Solution	No



Contents

Units

TABLE 1

Unit System	Metric (mm, kg, N, s, mV, mA) 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\HP\AppData\Local\Temp\WB_DESKTOP-9HN7LMH_HP_16944_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	912.63 mm
Length Y	1335.5 mm
Length Z	1830.7 mm
Properties	
Volume	1.4687e+007 mm³
Mass	65.05 kg
Scale Factor Value	1.

Statistics	
Bodies	1
Active Bodies	1
Nodes	364305
Elements	189253
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
Clean Bodies On Import	No
Stitch Surfaces On Import	None
Decompose Disjoint Geometry	Yes
Enclosure and Symmetry Processing	Yes

TABLE 3
Model (A4) > Geometry > Parts

Object Name	*Solid*
State	Meshed
Graphics Properties	
Visible	Yes
Definition	
Suppressed	No
Stiffness Behavior	Flexible
Coordinate System	Default Coordinate System
Reference Temperature	By Environment
Treatment	None
Material	
Assignment	Titanium alloy, Ti-6Al-4V, annealed
Nonlinear Effects	Yes
Thermal Strain Effects	Yes
Bounding Box	
Length X	912.63 mm
Length Y	1335.5 mm
Length Z	1830.7 mm

Properties	
Volume	1.4687e+007 mm³
Mass	65.05 kg
Centroid X	2.159 mm
Centroid Y	518.95 mm
Centroid Z	282.07 mm
Moment of Inertia Ip1	2.4999e+007 kg·mm²
Moment of Inertia Ip2	1.8931e+007 kg·mm²
Moment of Inertia Ip3	1.33e+007 kg·mm²
Statistics	
Nodes	364305
Elements	189253
Mesh Metric	None

TABLE 4
Model (A4) > Materials

Object Name	*Materials*
State	Fully Defined
Statistics	
Materials	2
Material Assignments	1

TABLE 5
Model (A4) > Materials > Titanium alloy, Ti-6Al-4V, annealed Assignment

Object Name	*Titanium alloy, Ti-6Al-4V, annealed Assignment*
State	Fully Defined
General	
Scoping Method	Geometry Selection
Geometry	1 Body
Definition	
Material Name	Titanium alloy, Ti-6Al-4V, annealed
Nonlinear Effects	Yes
Thermal Strain Effects	Yes
Reference Temperature	By Environment
Suppressed	No

Coordinate Systems

TABLE 6
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. mm
Origin Y	0. mm
Origin Z	0. mm
Directional Vectors	
X Axis Data	[1. 0. 0.]
Y Axis Data	[0. 1. 0.]
Z Axis Data	[0. 0. 1.]

Mesh

TABLE 7
Model (A4) > Mesh

Object Name	*Mesh*
State	Solved
Display	
Display Style	Use Geometry Setting
Defaults	
Physics Preference	Mechanical
Element Order	Program Controlled
Element Size	5.0 mm
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	2442.9 mm
Average Surface Area	9685.7 mm²
Minimum Edge Length	0.1027 mm
Quality	
Check Mesh Quality	Yes, Errors
Error Limits	Aggressive 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
Rigid Body Behavior	Dimensionally Reduced
Triangle Surface Mesher	Program Controlled
Topology Checking	Yes
Pinch Tolerance	Please Define
Generate Pinch on Refresh	No
Statistics	
Nodes	364305
Elements	189253

Static Structural (A5)

TABLE 8
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 9
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	Program Controlled
Advanced	
Inverse Option	No
Contact Split (DMP)	Off
Output Controls	
Stress	Yes
Surface Stress	No
Back Stress	No
Strain	Yes
Contact Data	Yes
Nonlinear Data	No
Nodal Forces	No
Volume and Energy	Yes
Euler Angles	Yes
Contact Miscellaneous	No
General Miscellaneous	No

Store Results At	All Time Points
Result File Compression	Program Controlled
Analysis Data Management	
Solver Files Directory	C:\Users\HP\AppData\Local\Temp\WB_DESKTOP-9HN7LMH_HP_16944_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	Yes
Solver Units	Active System
Solver Unit System	nmm

TABLE 10
Model (A4) > Static Structural (A5) > Loads

Object Name	*Fixed Support*	*Fixed Support 2*	*Force*
State	Fully Defined		
Scope			
Scoping Method	Geometry Selection		
Geometry	1473 Element Faces	1590 Element Faces	6 Faces
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			0. N (ramped)
Z Component			-10000 N (ramped)

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

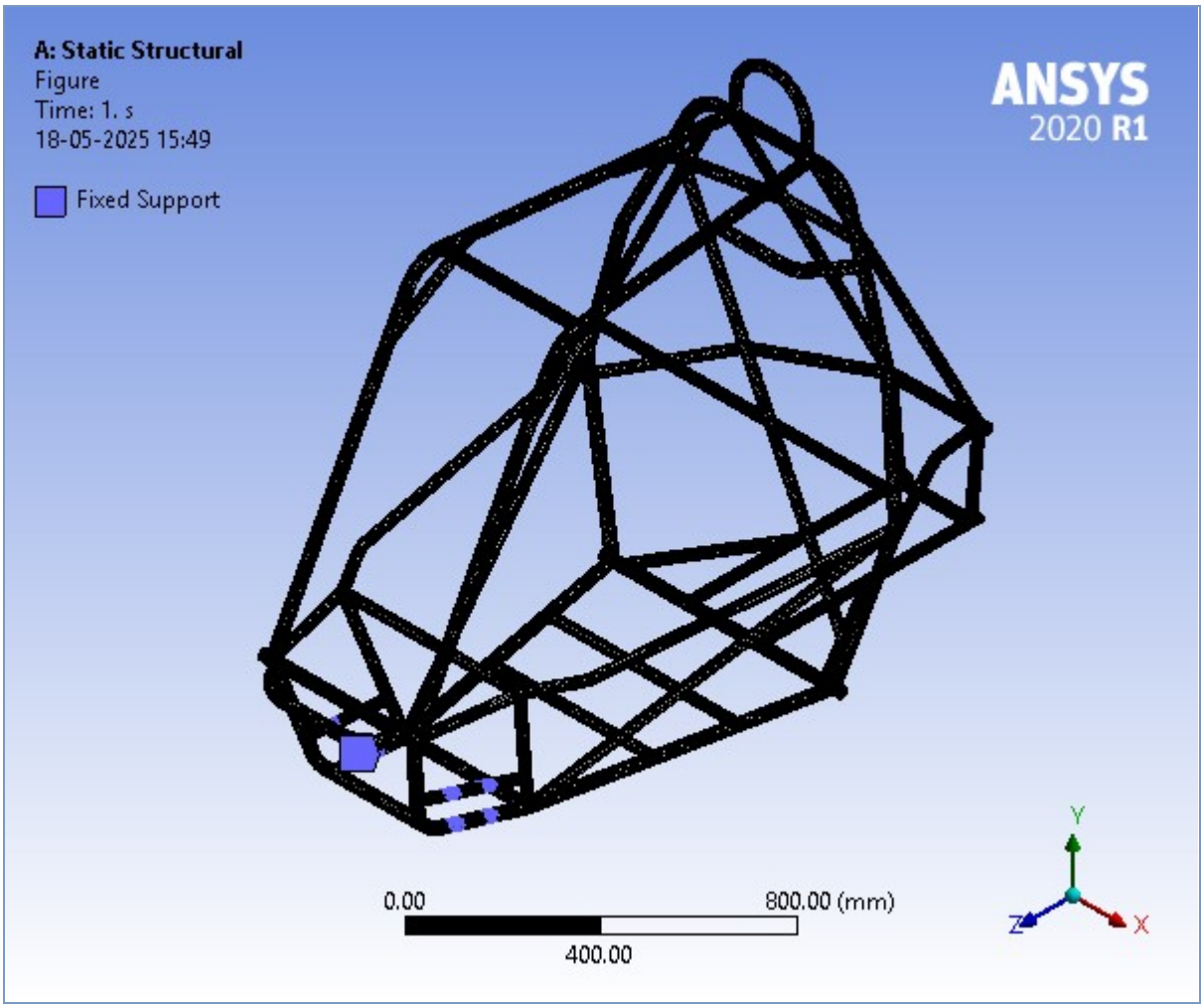


FIGURE 2
Model (A4) > Static Structural (A5) > Fixed Support 2 > Figure

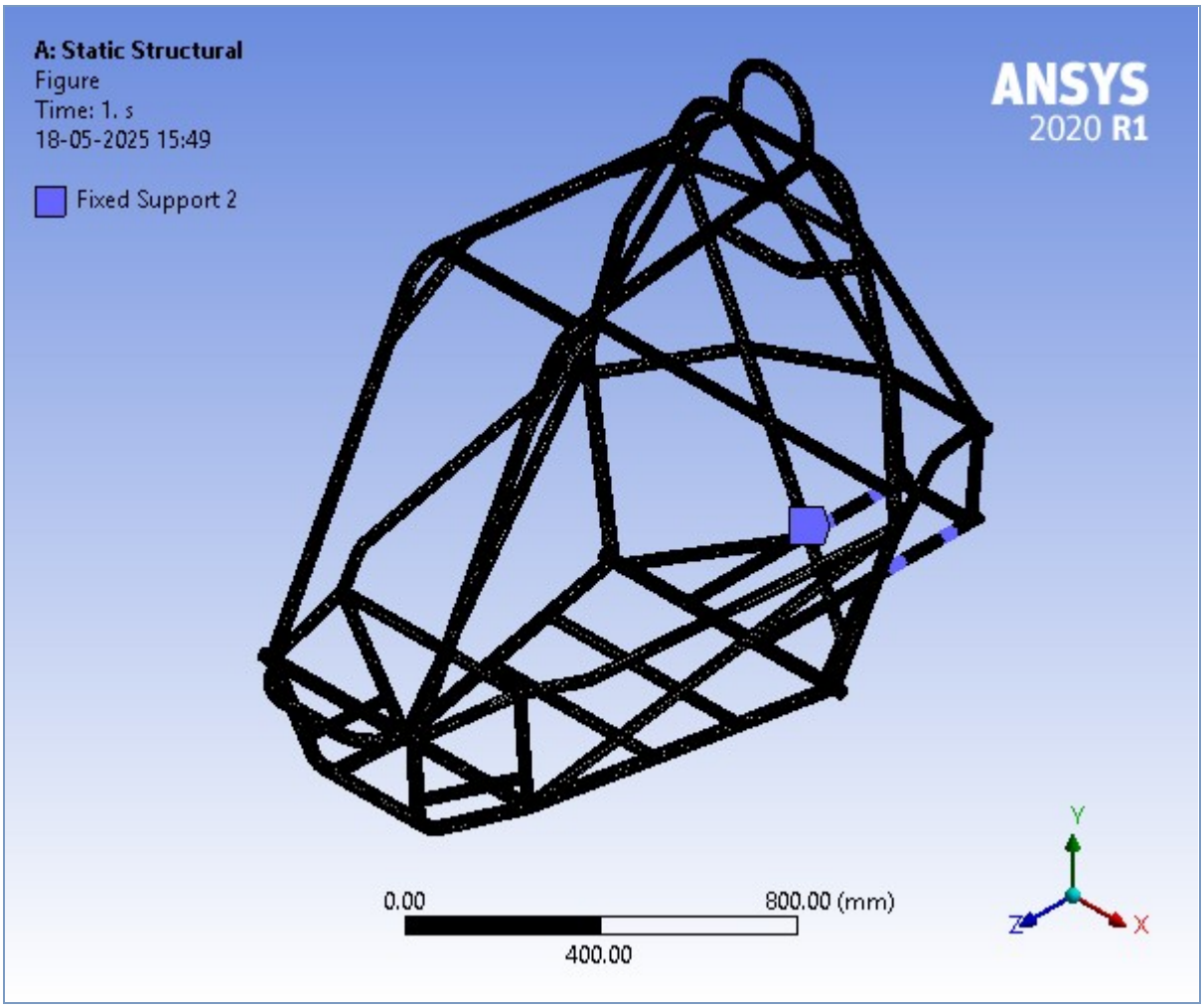


FIGURE 3
Model (A4) > Static Structural (A5) > Force

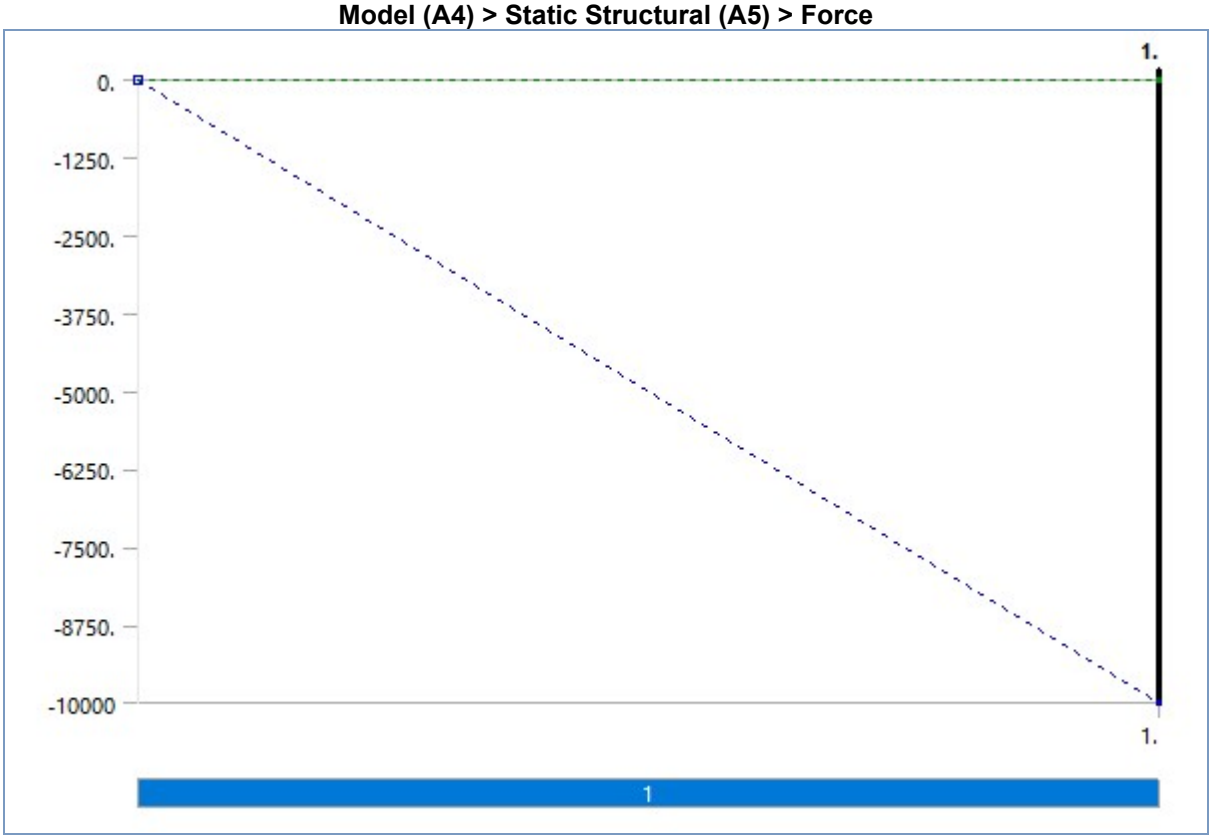
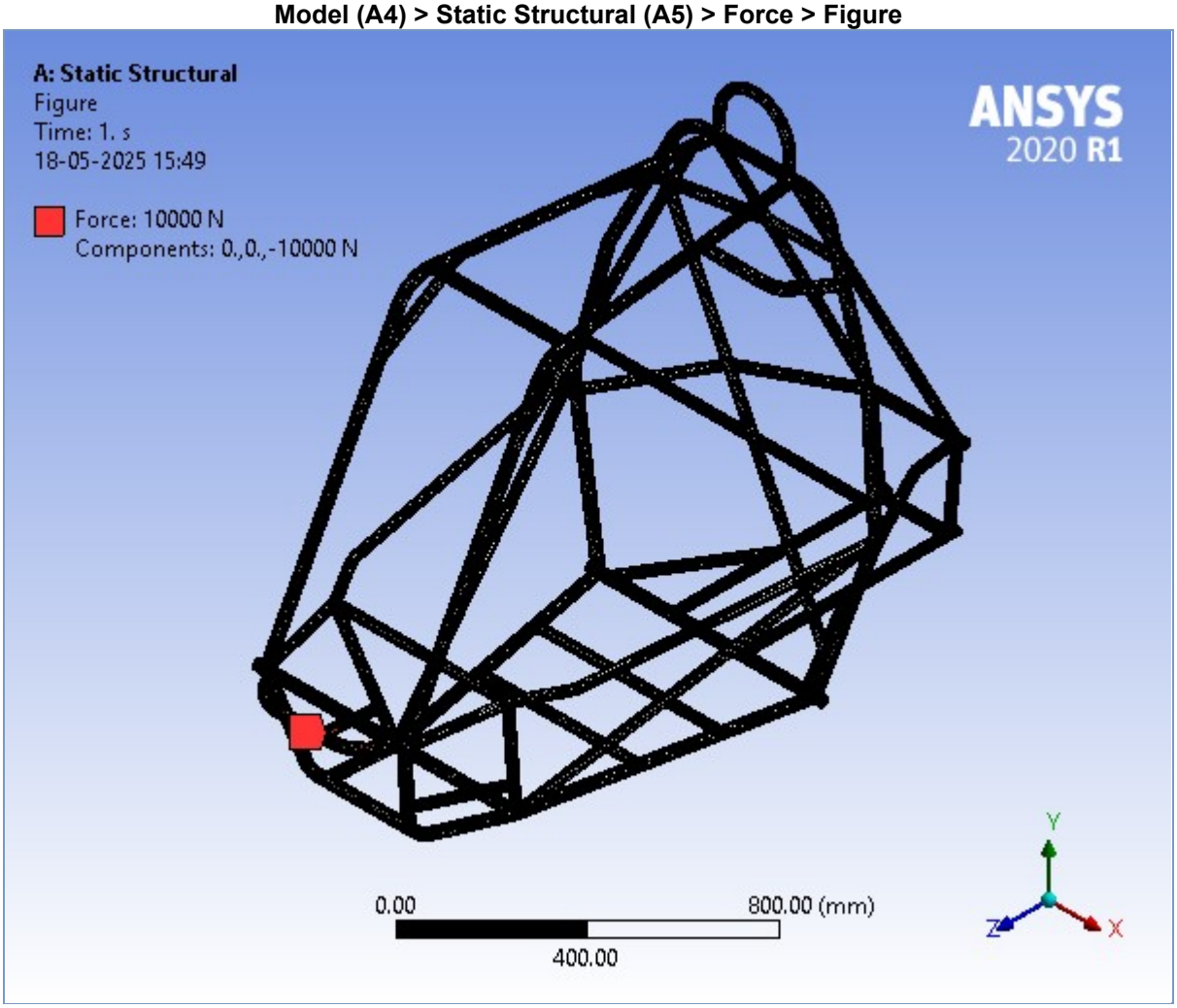


FIGURE 4
Model (A4) > Static Structural (A5) > Force > Figure



Solution (A6)

TABLE 11
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	6 m 4 s
MAPDL Memory Used	1.9385 GB
MAPDL Result File Size	345.19 MB
Post Processing	
Beam Section Results	No
On Demand Stress/Strain	No

TABLE 12
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 13
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		
Calculate Time History	Yes		
Identifier			
Suppressed	No		
Results			
Minimum	0. mm	4.1114e-019 mm/mm	1.194e-014 MPa
Maximum	0.87438 mm	1.6471e-003 mm/mm	179.12 MPa
Average	0.4544 mm	6.6917e-005 mm/mm	6.8434 MPa
Minimum Occurs On	Solid		
Maximum Occurs On	Solid		
Minimum Value Over Time			
Minimum	0. mm	8.223e-020 mm/mm	2.388e-015 MPa
Maximum	0. mm	4.1114e-019 mm/mm	1.194e-014 MPa
Maximum Value Over Time			
Minimum	0.17488 mm	3.2942e-004 mm/mm	35.825 MPa
Maximum	0.87438 mm	1.6471e-003 mm/mm	179.12 MPa
Information			
Time	1. s		
Load Step	1		
Substep	4		
Iteration Number	5		
Integration Point Results			
Display Option		Averaged	
Average Across Bodies		No	

FIGURE 5
Model (A4) > Static Structural (A5) > Solution (A6) > Total Deformation

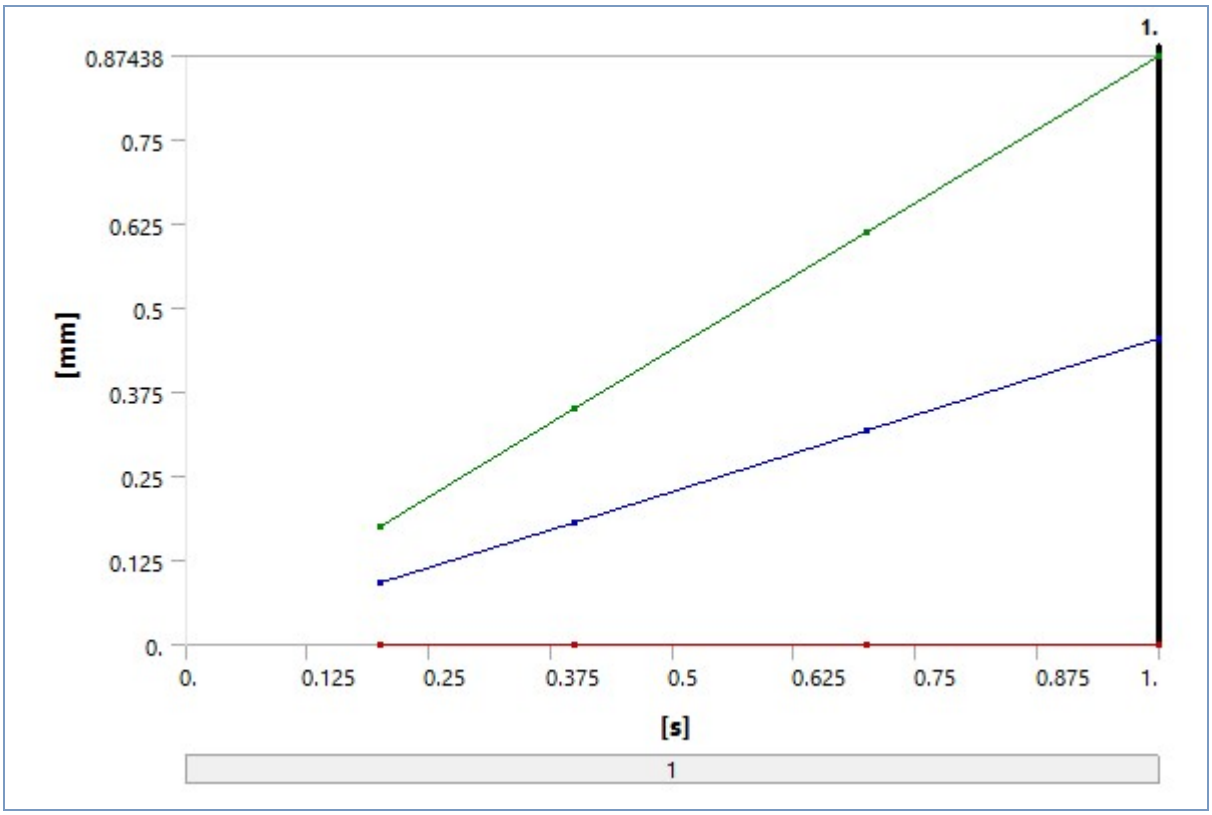


TABLE 14
Model (A4) > Static Structural (A5) > Solution (A6) > Total Deformation

Time [s]	Minimum [mm]	Maximum [mm]	Average [mm]
0.2	0.	0.17488	9.088e-002
0.4		0.34975	0.18176
0.7		0.61206	0.31808
1.		0.87438	0.4544

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

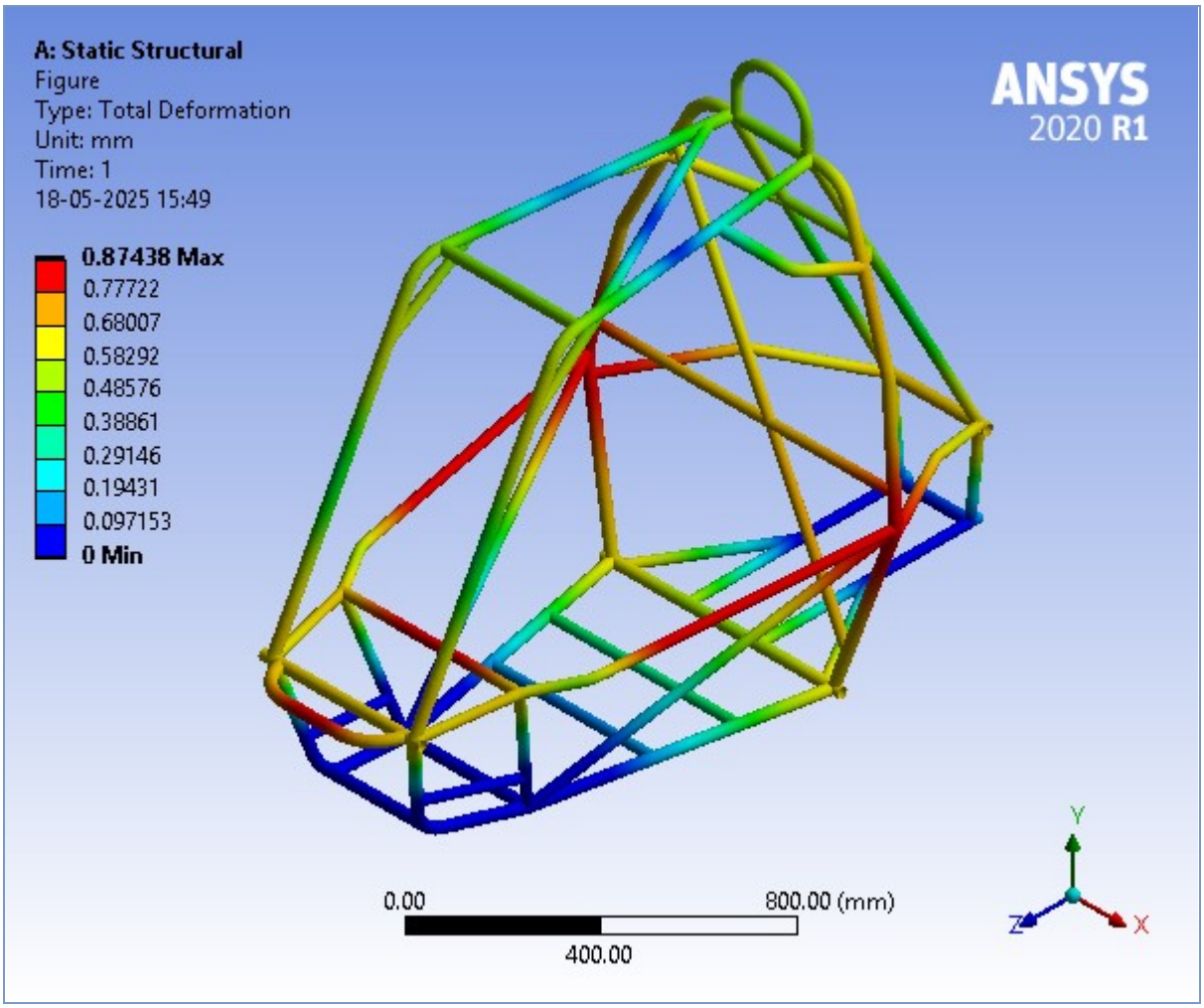


FIGURE 7
Model (A4) > Static Structural (A5) > Solution (A6) > Equivalent Elastic Strain

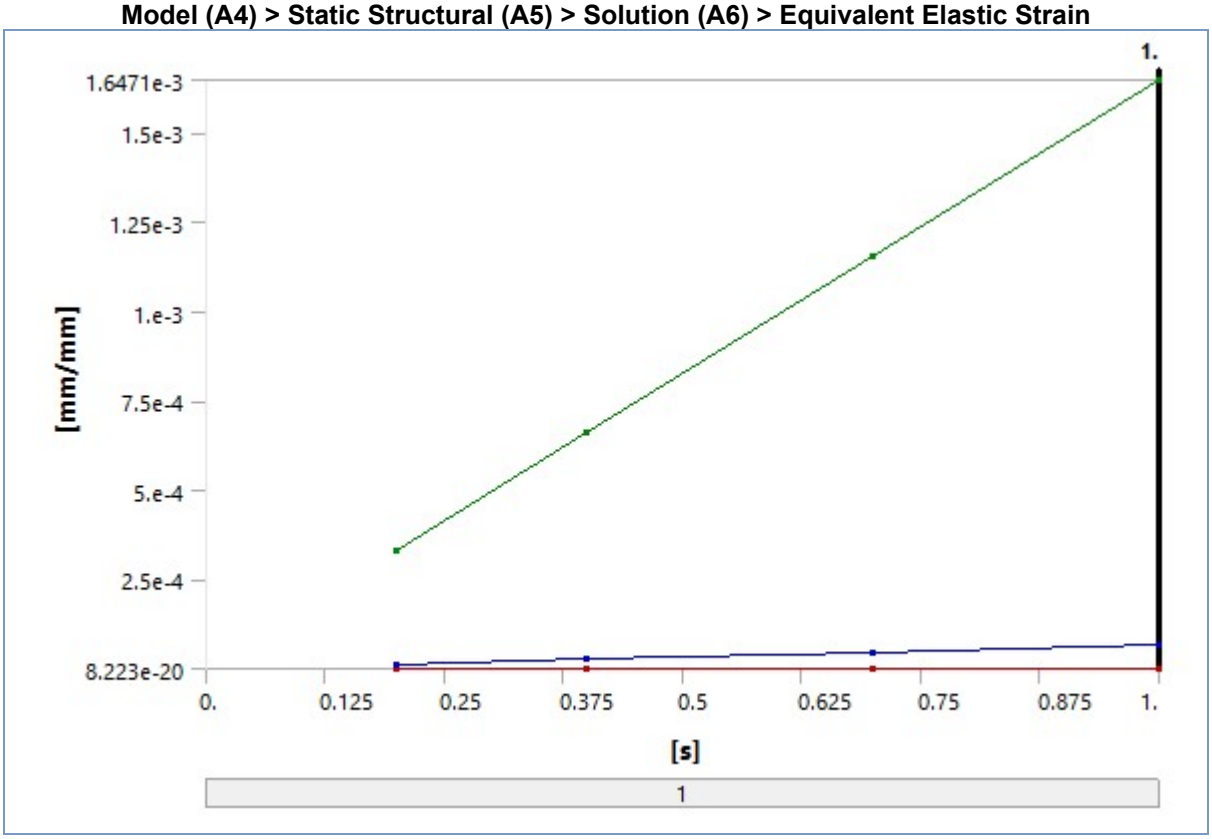


TABLE 15
Model (A4) > Static Structural (A5) > Solution (A6) > Equivalent Elastic Strain

Time [s]	Minimum [mm/mm]	Maximum [mm/mm]	Average [mm/mm]
0.2	8.223e-020	3.2942e-004	1.3383e-005
0.4	1.6446e-019	6.5884e-004	2.6767e-005
0.7	2.878e-019	1.153e-003	4.6842e-005
1.	4.1114e-019	1.6471e-003	6.6917e-005

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

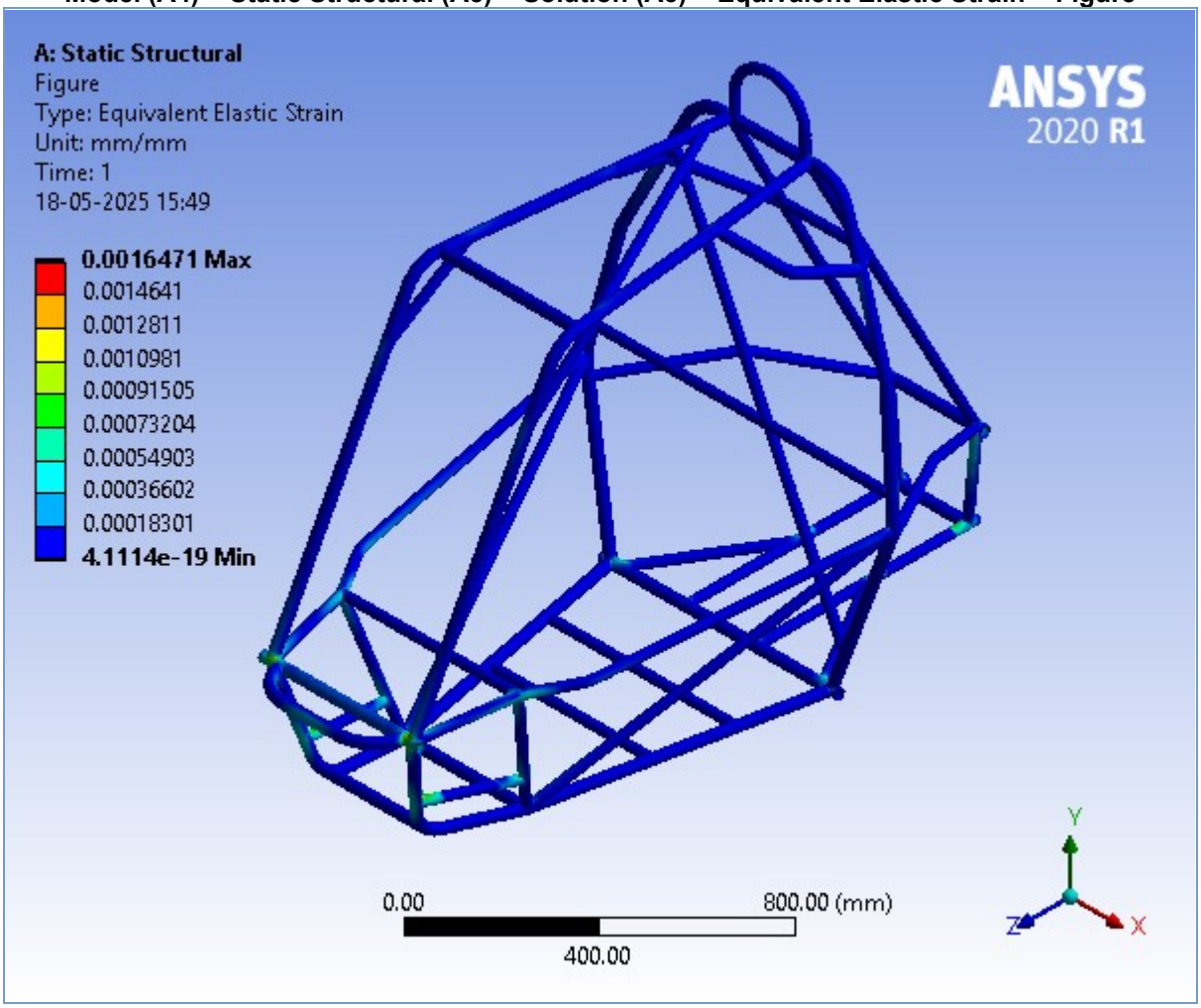


FIGURE 9
Model (A4) > Static Structural (A5) > Solution (A6) > Equivalent Stress

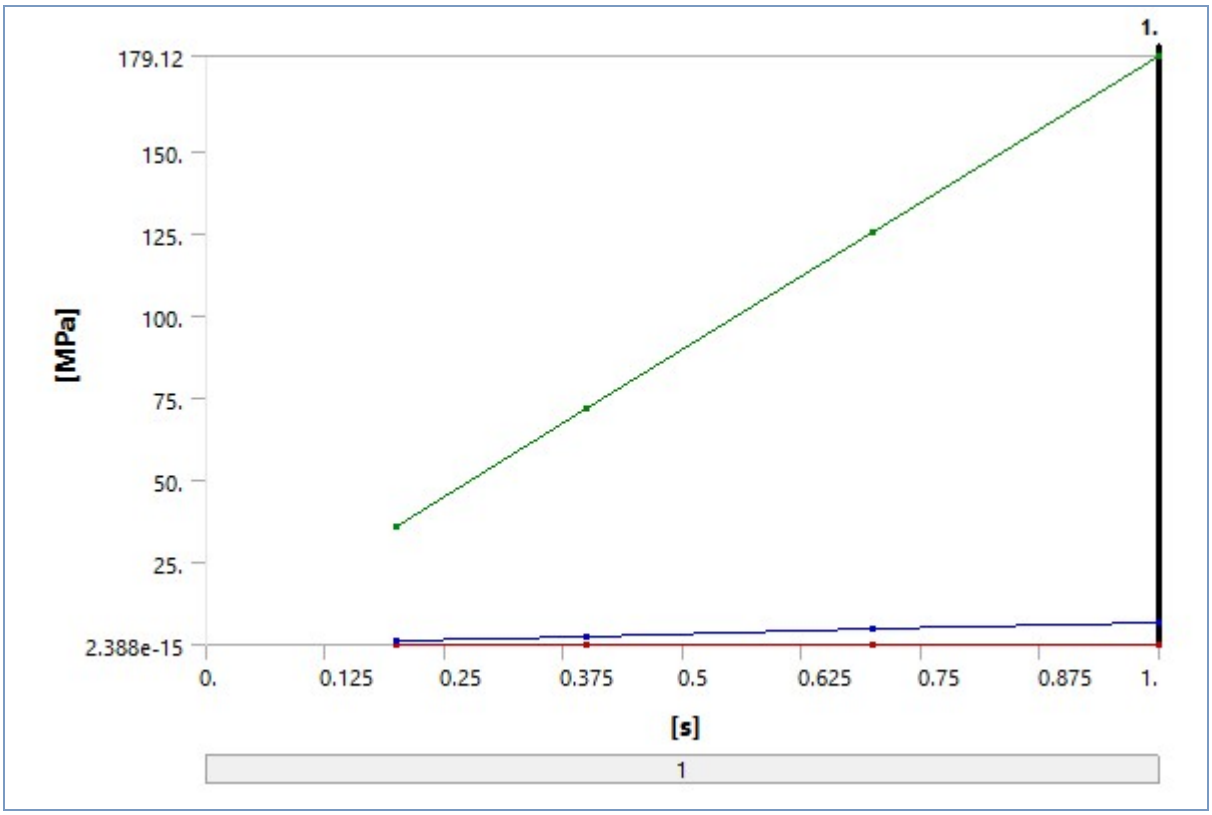


TABLE 16
Model (A4) > Static Structural (A5) > Solution (A6) > Equivalent Stress

Time [s]	Minimum [MPa]	Maximum [MPa]	Average [MPa]
0.2	2.388e-015	35.825	1.3687
0.4	4.7759e-015	71.65	2.7373
0.7	8.3578e-015	125.39	4.7904
1.	1.194e-014	179.12	6.8434

FIGURE 10
Model (A4) > Static Structural (A5) > Solution (A6) > Equivalent Stress > Figure

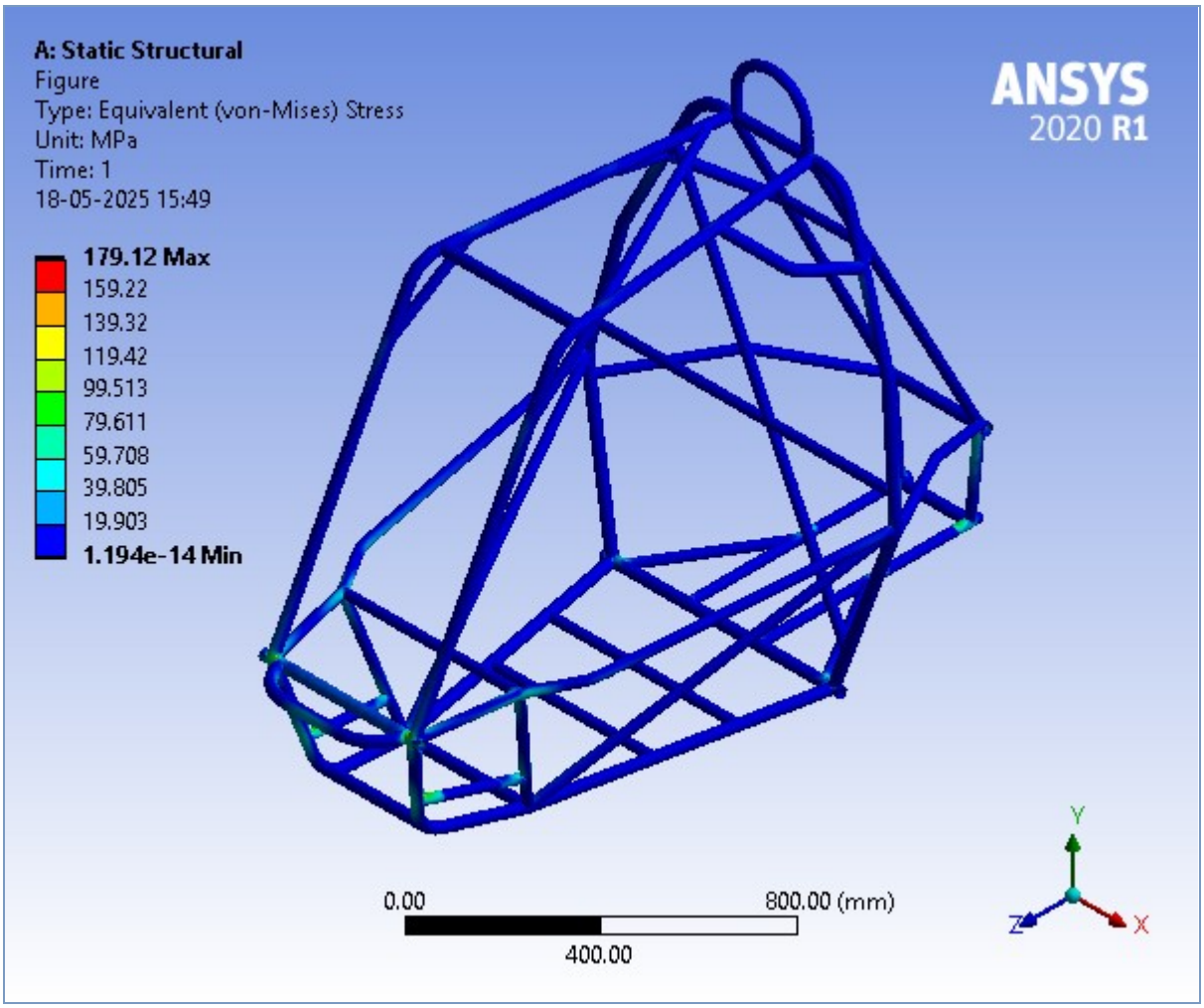


TABLE 17
Model (A4) > Static Structural (A5) > Solution (A6) > Stress Safety Tools

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

TABLE 18
Model (A4) > Static Structural (A5) > Solution (A6) > Stress Tool > Results

Object Name	*Safety Factor*
State	Solved
Scope	
Scoping Method	Geometry Selection
Geometry	All Bodies
Definition	
Type	Safety Factor
By	Time
Display Time	Last
Calculate Time History	Yes
Identifier	
Suppressed	No
Integration Point Results	
Display Option	Averaged
Average Across Bodies	No
Results	

Minimum	4.7213
Minimum Occurs On	Solid
Minimum Value Over Time	
Minimum	4.7213
Maximum	15.
Maximum Value Over Time	
Minimum	15.
Maximum	15.
Information	
Time	1. s
Load Step	1
Substep	4
Iteration Number	5

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

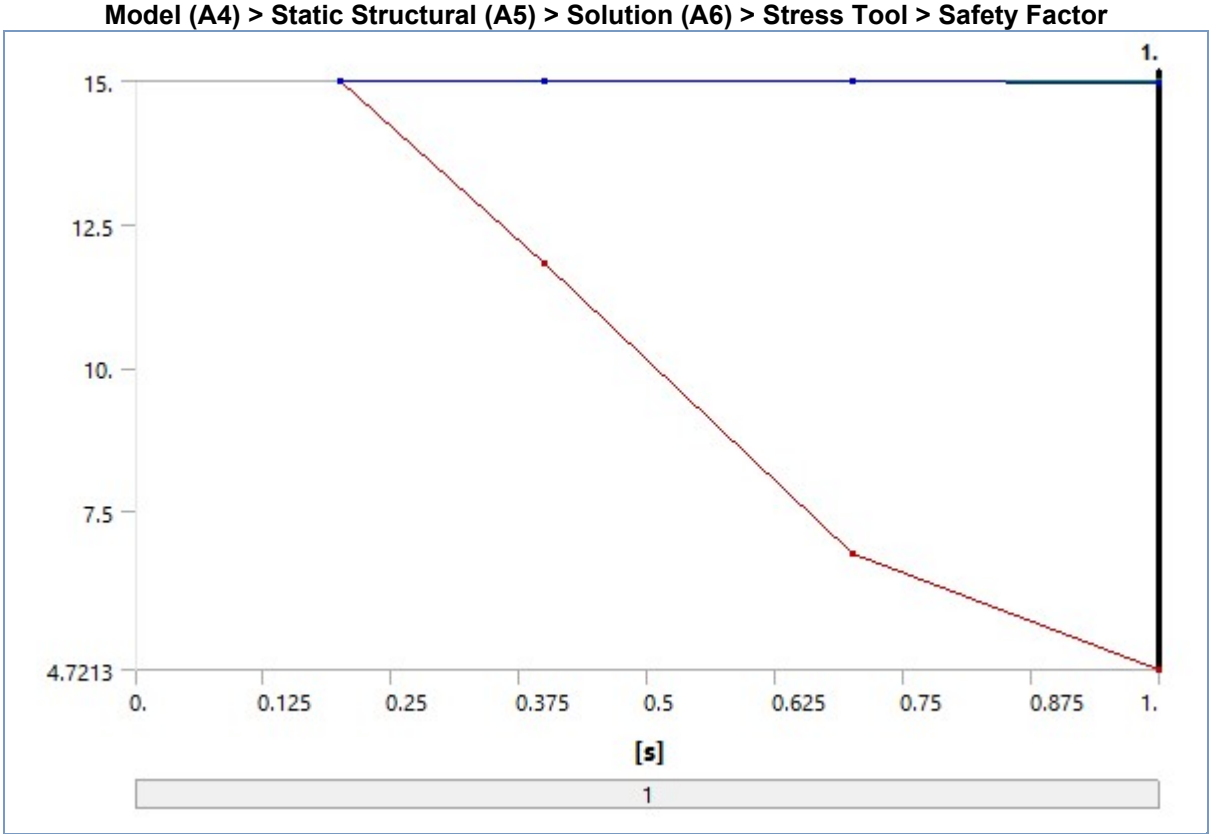
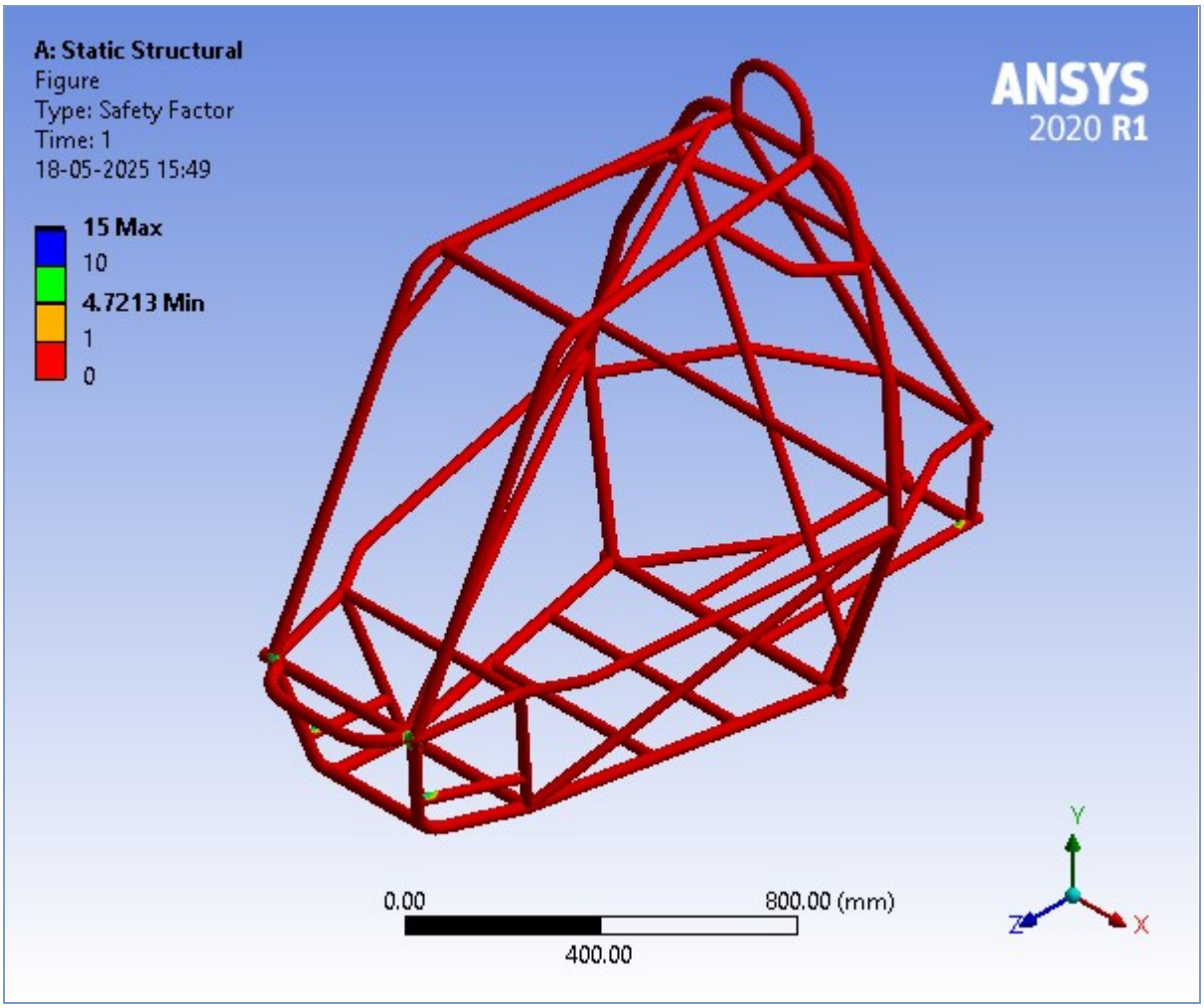


TABLE 19
Model (A4) > Static Structural (A5) > Solution (A6) > Stress Tool > Safety Factor

Time [s]	Minimum	Maximum	Average
0.2	15.	15.	15.
0.4	11.803		
0.7	6.7447		14.997
1.	4.7213		14.98

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



Material Data

Titanium alloy, Ti-6Al-4V, annealed

TABLE 20
Titanium alloy, Ti-6Al-4V, annealed > Constants

Density	4.429e-006 kg mm^-3
Tensile Yield Strength	845.7 MPa
Tensile Ultimate Strength	1017 MPa
Isotropic Resistivity	1.69e-003 ohm mm

TABLE 21
Titanium alloy, Ti-6Al-4V, annealed > Appearance

Red	Green	Blue
165	165	165

TABLE 22
Titanium alloy, Ti-6Al-4V, annealed > Isotropic Elasticity

Young's Modulus MPa	Poisson's Ratio	Bulk Modulus MPa	Shear Modulus MPa	Temperature C
1.139e+005	0.3387	1.1769e+005	42541	-6.104e-006
1.062e+005	0.3387	1.0973e+005	39665	66.67
1.014e+005	0.3387	1.0477e+005	37873	133.3
98020	0.3387	1.0128e+005	36610	200
94870	0.3387	98026	35434	266.7
90540	0.3387	93552	33816	333.3
83730	0.3387	86516	31273	400

72960	0.3387	75387	27250	466.7
56990	0.3387	58886	21286	533.3
34510	0.3387	35658	12889	600

TABLE 23
Titanium alloy, Ti-6Al-4V, annealed > Bilinear Isotropic Hardening

Yield Strength MPa	Tangent Modulus MPa	Temperature C
845.7	2330	23

TABLE 24
Titanium alloy, Ti-6Al-4V, annealed > S-N Curve

Alternating Stress MPa	Cycles	R-Ratio
921.9	100	-1
855.9	464.2	-1
798.6	2154	-1
746.7	10000	-1
698.8	46420	-1
654.2	2.154e+005	-1
612.6	1.e+006	-1
573.6	4.642e+006	-1
537.2	2.154e+007	-1
503.1	1.e+008	-1

TABLE 25
Titanium alloy, Ti-6Al-4V, annealed > Isotropic Secant Coefficient of Thermal Expansion

Coefficient of Thermal Expansion C^-1	Temperature C
6.205e-006	-260.2
8.145e-006	-146.8
8.627e-006	-33.48
8.953e-006	79.85
9.25e-006	193.2
9.516e-006	306.5
9.753e-006	419.9
9.96e-006	533.2
1.014e-005	646.5
1.028e-005	759.9
Zero-Thermal-Strain Reference Temperature C	
20	

TABLE 26
Titanium alloy, Ti-6Al-4V, annealed > Isotropic Thermal Conductivity

Thermal Conductivity W mm^-1 C^-1	Temperature C
7.101e-003	-6.104e-006
7.188e-003	23.33
7.298e-003	46.67
7.43e-003	70
7.582e-003	93.33
7.753e-003	116.7
7.942e-003	140
8.147e-003	163.3
8.367e-003	186.7
8.6e-003	210
8.846e-003	233.3
9.103e-003	256.7
9.369e-003	280
9.643e-003	303.3
9.924e-003	326.7

1.021e-002	350
1.05e-002	373.3
1.079e-002	396.7
1.109e-002	420
1.138e-002	443.3
1.168e-002	466.7
1.197e-002	490
1.225e-002	513.3
1.254e-002	536.7
1.281e-002	560
1.308e-002	583.3
1.333e-002	606.7
1.358e-002	630
1.381e-002	653.3
1.424e-002	700

TABLE 27
Titanium alloy, Ti-6Al-4V, annealed > Specific Heat Constant Pressure

Specific Heat mJ kg^-1 C^-1	Temperature C
5.142e+005	-6.104e-006
5.228e+005	23.33
5.316e+005	46.67
5.407e+005	70
5.501e+005	93.33
5.598e+005	116.7
5.696e+005	140
5.797e+005	163.3
5.899e+005	186.7
6.002e+005	210
6.107e+005	233.3
6.214e+005	256.7
6.321e+005	280
6.428e+005	303.3
6.537e+005	326.7
6.645e+005	350
6.753e+005	373.3
6.862e+005	396.7
6.97e+005	420
7.077e+005	443.3
7.184e+005	466.7
7.289e+005	490
7.393e+005	513.3
7.496e+005	536.7
7.597e+005	560
7.697e+005	583.3
7.794e+005	606.7
7.889e+005	630
7.981e+005	653.3
8.157e+005	700