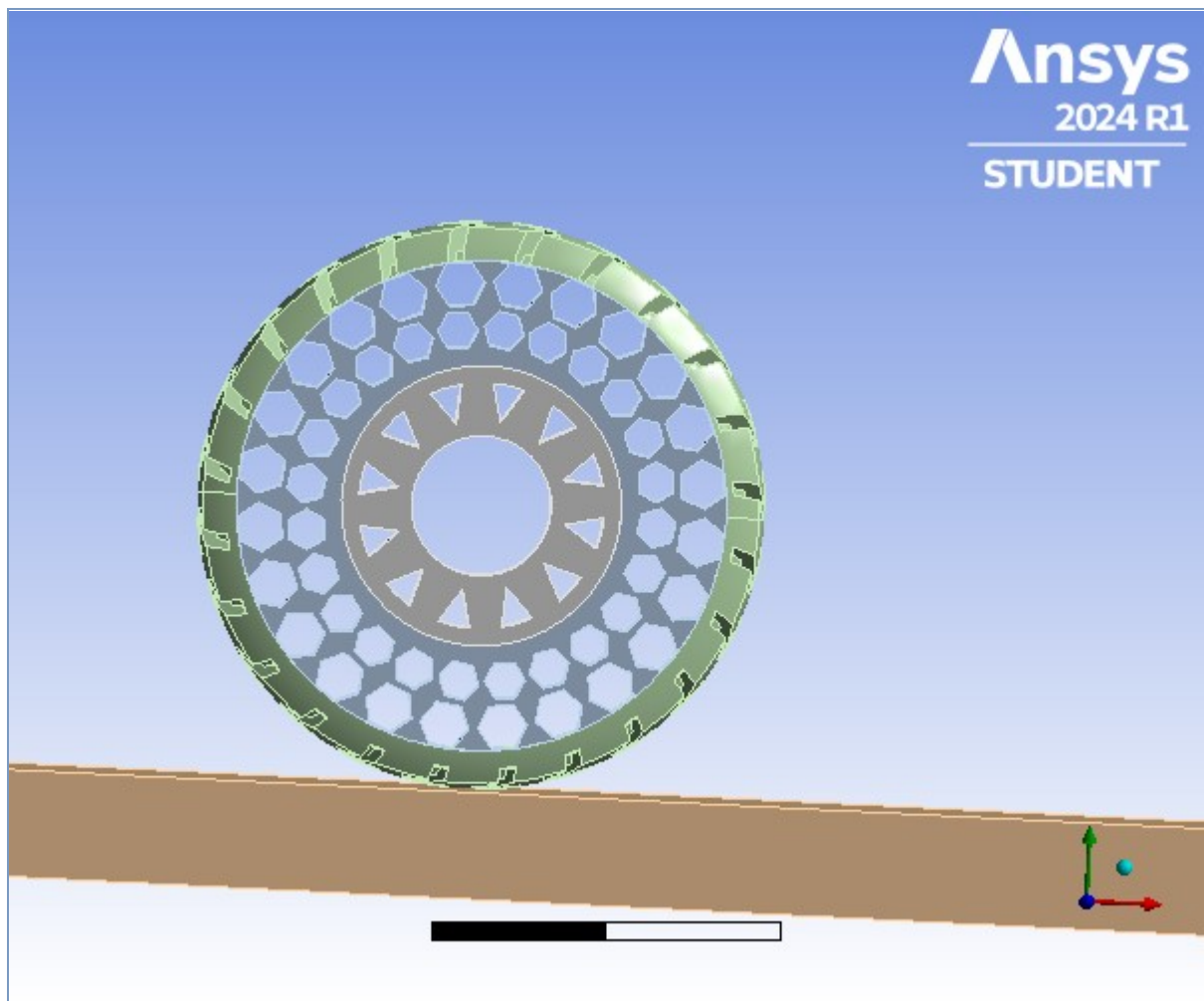# Project

First Saved	Tuesday, December 24, 2024
Last Saved	Tuesday, December 24, 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	
Source	C:\Users\HP\OneDrive\Desktop\sexy_model.STEP
Type	Step
Basic Geometry Options	
Solid Bodies	Yes
Surface Bodies	Yes
Line Bodies	No
Parameters	Independent

Parameter Key	ANS;DS
Attributes	No
Named Selections	No
Material Properties	No
Advanced Geometry Options	
Use Associativity	Yes
Coordinate Systems	No
Reader Mode Saves Updated File	No
Use Instances	Yes
Smart CAD Update	Yes
Compare Parts On Update	No
Analysis Type	3-D
Mixed Import Resolution	None
Import Facet Quality	Source
Clean Bodies On Import	No
Stitch Surfaces On Import	None
Decompose Disjoint Geometry	Yes
Enclosure and Symmetry Processing	Yes

Geometry

TABLE 4
Model (A4) > Geometry

Object Name	*Geometry*
State	Fully Defined
Definition	
Source	C:\Users\HP\OneDrive\Desktop\sexy_model.STEP
Type	Step
Length Unit	Inches
Element Control	Program Controlled
Display Style	Body Color
Bounding Box	
Length X	1.8005 m
Length Y	0.9624 m
Length Z	1.016 m
Properties	
Volume	0.33876 m³
Mass	777.48 kg
Scale Factor Value	1.
Statistics	
Bodies	4
Active Bodies	4
Nodes	37635
Elements	15461
Mesh Metric	None
Update Options	
Assign Default Material	No
Basic Geometry Options	
Solid Bodies	Yes
Surface Bodies	Yes
Line Bodies	No
Parameters	Independent
Parameter Key	ANS;DS
Attributes	No
Named Selections	No
Material Properties	No

Advanced Geometry Options	
Use Associativity	Yes
Coordinate Systems	No
Reader Mode Saves Updated File	No
Use Instances	Yes
Smart CAD Update	Yes
Compare Parts On Update	No
Analysis Type	3-D
Mixed Import Resolution	None
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	assembly finals|hub|Cut-Extrude2	assembly finals|spokes|Cut-Extrude3	assembly finals|shear band with treads|Cut-Extrude10	surface|Boss-Extrude1
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	Aluminum Alloy	POLYURETH		CONCRETE-L
Nonlinear Effects	Yes			
Thermal Strain Effects	Yes			
Bounding Box				
Length X	0.4 m	0.77899 m	0.81 m	1.8005 m
Length Y	0.4 m	0.77899 m	0.81 m	0.1524 m
Length Z	0.2 m		0.18693 m	1.016 m
Properties				
Volume	1.5801e-002 m³	2.5253e-002 m³	1.8918e-002 m³	0.27878 m³
Mass	44.243 kg	30.304 kg	22.701 kg	680.23 kg
Centroid X	-0.20432 m			-2.953e-002 m
Centroid Y	0.40389 m		0.3936 m	-7.7309e-002 m
Centroid Z	7.2939e-002 m	6.3271e-002 m	6.0179e-002 m	6.8105e-002 m
Moment of Inertia Ip1	0.69775 kg·m²	1.2472 kg·m²	3.1799 kg·m²	59.831 kg·m²
Moment of Inertia Ip2	0.69775 kg·m²	1.2472 kg·m²	1.6425 kg·m²	242.28 kg·m²
Moment of Inertia Ip3	1.1006 kg·m²	2.2924 kg·m²	1.6405 kg·m²	185.08 kg·m²
Statistics				
Nodes	3181	9445	22918	2091
Elements	492	1503	13126	340

Mesh Metric	None

TABLE 6
Model (A4) > Materials

Object Name	*Materials*
State	Fully Defined
Statistics	
Materials	7
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	3
Active Contacts	3
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	5.701e-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	3
Active Connections	3

TABLE 10
Model (A4) > Connections > Contacts > Contact Regions

Object Name	*Contact Region*	*Contact Region 2*	*Contact Region 3*
State	Fully Defined		
Scope			
Scoping Method	Geometry Selection		
Contact	2 Faces	4 Faces	1 Face
Target	2 Faces	5 Faces	1 Face
Contact Bodies	assembly finals|hub|Cut-Extrude2	assembly finals|spokes|Cut-Extrude3	assembly finals|shear band with treads|Cut-Extrude10
Target Bodies	assembly finals|spokes|Cut-Extrude3	assembly finals|shear band with treads|Cut-Extrude10	surface|Boss-Extrude1
Protected	No		
Definition			
Type	Bonded		
Scope Mode	Automatic		
Behavior	Program Controlled		
Trim Contact	Program Controlled		
Trim Tolerance	5.701e-003 m		
Contact APDL Name			
Target APDL Name			
Suppressed	No		
Display			
Element Normals	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 11
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	2.2804 m
Average Surface Area	1.1662e-002 m²
Minimum Edge Length	1.7245e-004 m
Quality	
Check Mesh Quality	Yes, Errors
Error Limits	Aggressive 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	37635
Elements	15461
Show Detailed Statistics	No

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\HP\OneDrive\Desktop\Minor Project\non_pneumatic_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 14
Model (A4) > Static Structural (A5) > Loads

Object Name	*Fixed Support*	*Force*
State	Fully Defined	
Scope		
Scoping Method	Geometry Selection	
Geometry	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		-6125. N (ramped)
Z Component		0. N (ramped)

FIGURE 1
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	8. s
MAPDL Memory Used	805. MB
MAPDL Result File Size	11.875 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 Stress*	*Equivalent Elastic Strain*
State	Solved		
Scope			
Scoping Method	Geometry Selection		
Geometry	All Bodies		
Definition			
Type	Total Deformation	Equivalent (von-Mises) Stress	Equivalent Elastic Strain
By	Time		
Display Time	Last		
Separate Data by Entity	No		
Calculate Time History	Yes		
Identifier			
Suppressed	No		
Results			
Minimum	0. m	0.29122 Pa	1.1836e-011 m/m
Maximum	3.2513e-002 m	4.3767e+006 Pa	0.14331 m/m
Average	1.4435e-002 m	69721 Pa	2.3831e-003 m/m
Minimum Occurs On	surface|Boss-Extrude1		
Maximum Occurs On	assembly finals|shear band with treads|Cut-Extrude10		
Information			
Time	1. s		
Load Step	1		
Substep	1		
Iteration Number	1		
Integration Point Results			
Display Option		Averaged	
Average Across Bodies		No	

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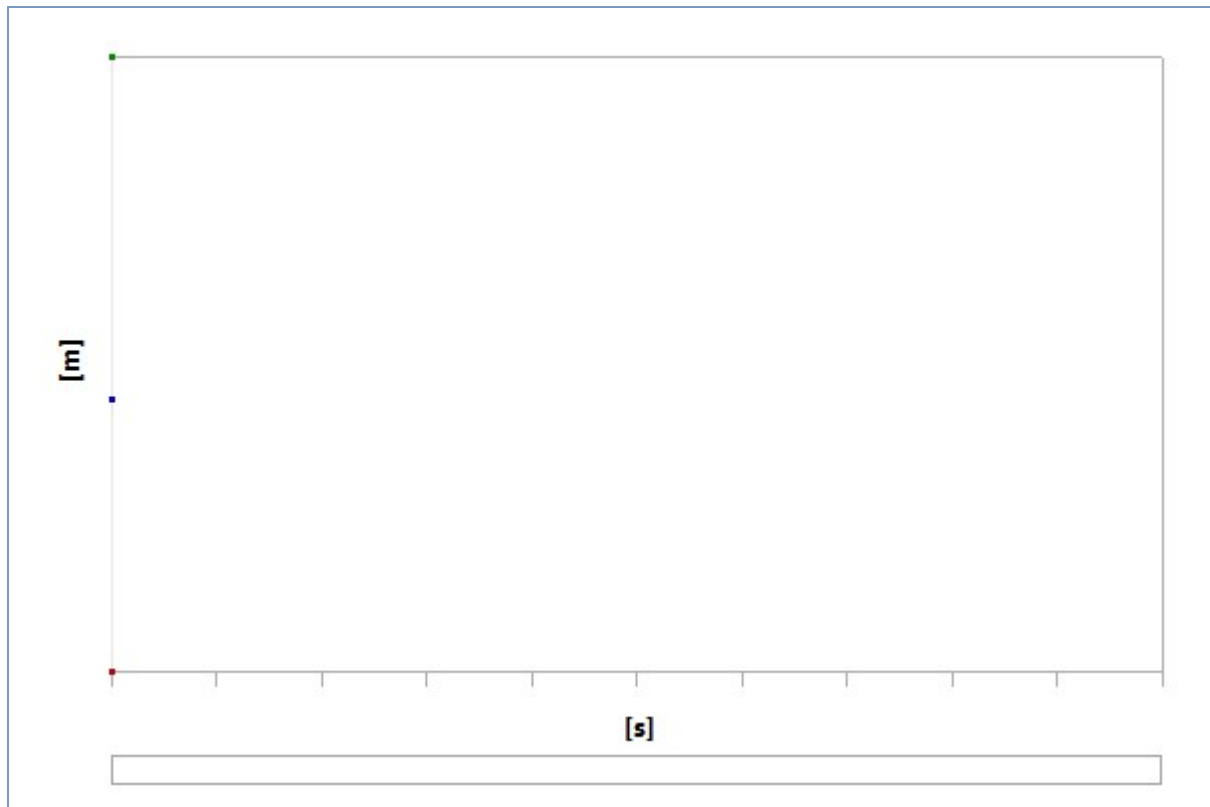**Model (A4) > Static Structural (A5) > Solution (A6) > Total Deformation**

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

Time [s]	Minimum [m]	Maximum [m]	Average [m]
1.	0.	3.2513e-002	1.4435e-002

FIGURE 3
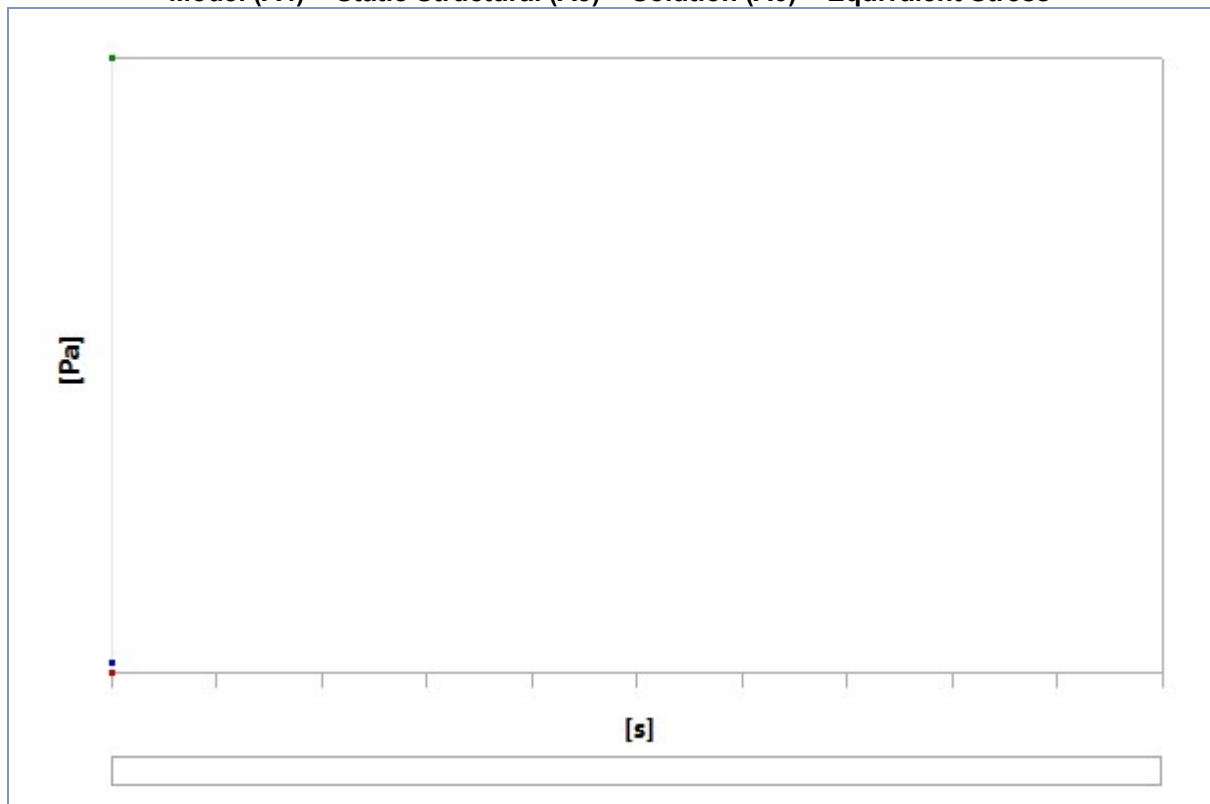**Model (A4) > Static Structural (A5) > Solution (A6) > Equivalent Stress**

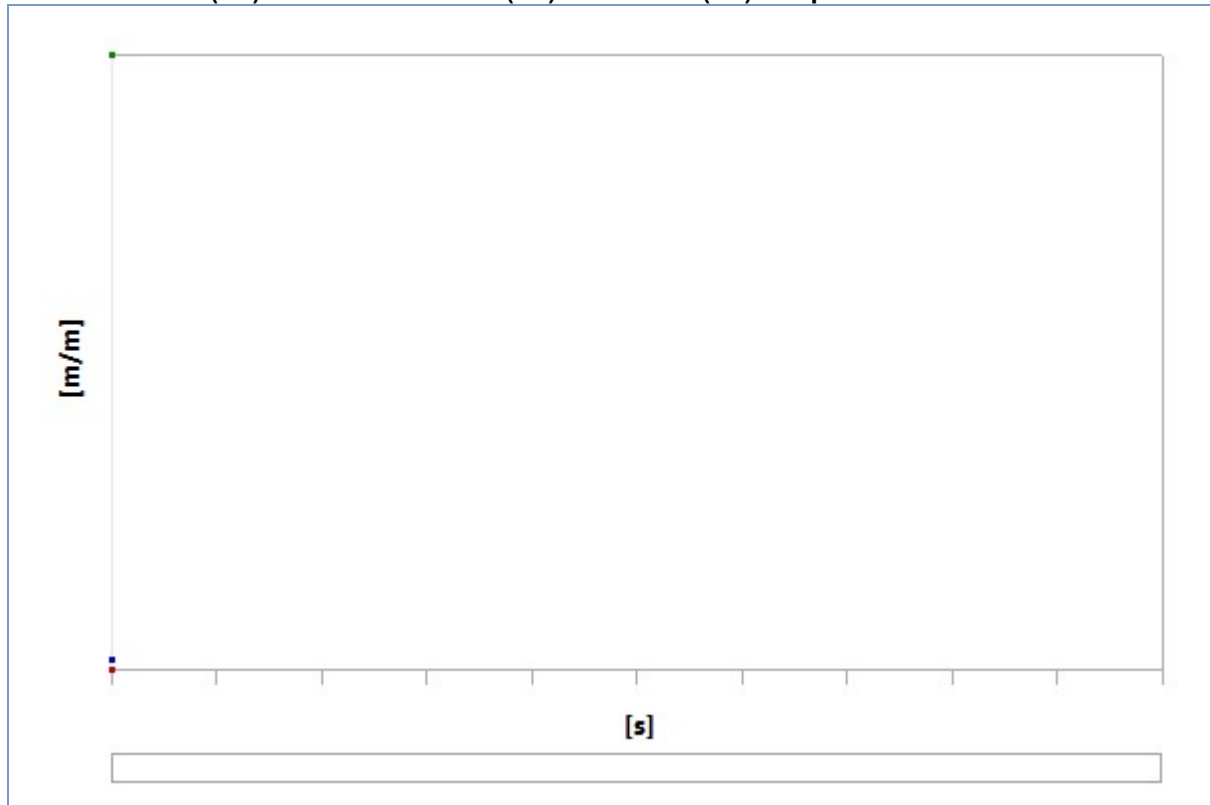**TABLE 19**

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

Time [s]	Minimum [Pa]	Maximum [Pa]	Average [Pa]
1.	0.29122	4.3767e+006	69721

FIGURE 4
Model (A4) > Static Structural (A5) > Solution (A6) > Equivalent Elastic Strain

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

Time [s]	Minimum [m/m]	Maximum [m/m]	Average [m/m]
1.	1.1836e-011	0.14331	2.3831e-003

Material Data

Aluminum Alloy

TABLE 21
Aluminum Alloy > Constants

Density	2800 kg m^-3
Coefficient of Thermal Expansion	2.3e-005 C^-1
Specific Heat	875 J kg^-1 C^-1

TABLE 22
Aluminum Alloy > Color

Red	Green	Blue
138	104	46

TABLE 23
Aluminum Alloy > Compressive Ultimate Strength

Compressive Ultimate Strength Pa
0

TABLE 24

Aluminum Alloy > Compressive Yield Strength

Compressive Yield Strength Pa
2.8e+008

TABLE 25
Aluminum Alloy > Tensile Yield Strength

Tensile Yield Strength Pa
2.8e+008

TABLE 26
Aluminum Alloy > Tensile Ultimate Strength

Tensile Ultimate Strength Pa
3.1e+008

TABLE 27
Aluminum Alloy > Isotropic Secant Coefficient of Thermal Expansion

Zero-Thermal-Strain Reference Temperature C
22

TABLE 28
Aluminum Alloy > Isotropic Thermal Conductivity

Thermal Conductivity W m^-1 C^-1	Temperature C
114	-100
144	0
165	100
175	200

TABLE 29
Aluminum Alloy > S-N Curve

Alternating Stress Pa	Cycles	R-Ratio
2.758e+008	1700	-1
2.413e+008	5000	-1
2.068e+008	34000	-1
1.724e+008	1.4e+005	-1
1.379e+008	8.e+005	-1
1.172e+008	2.4e+006	-1
8.963e+007	5.5e+007	-1
8.274e+007	1.e+008	-1
1.706e+008	50000	-0.5
1.396e+008	3.5e+005	-0.5
1.086e+008	3.7e+006	-0.5
8.791e+007	1.4e+007	-0.5
7.757e+007	5.e+007	-0.5
7.239e+007	1.e+008	-0.5
1.448e+008	50000	0
1.207e+008	1.9e+005	0
1.034e+008	1.3e+006	0
9.308e+007	4.4e+006	0
8.618e+007	1.2e+007	0
7.239e+007	1.e+008	0
7.412e+007	3.e+005	0.5
7.067e+007	1.5e+006	0.5
6.636e+007	1.2e+007	0.5
6.205e+007	1.e+008	0.5

TABLE 30
Aluminum Alloy > Isotropic Resistivity

Resistivity ohm m	Temperature C
2.43e-008	0
2.67e-008	20
3.63e-008	100

TABLE 31
Aluminum Alloy > Isotropic Elasticity

Young's Modulus Pa	Poisson's Ratio	Bulk Modulus Pa	Shear Modulus Pa	Temperature C
7.2e+010	0.33	7.0588e+010	2.7068e+010	

TABLE 32
Aluminum Alloy > Isotropic Relative Permeability

Relative Permeability
1

POLYURETH

TABLE 33
POLYURETH > Constants

Density	1200 kg m^-3

TABLE 34
POLYURETH > Bulk Modulus

Bulk Modulus Pa
2.e+009

TABLE 35
POLYURETH > Shear Modulus

Shear Modulus Pa
5.e+006

TABLE 36
POLYURETH > Principal Stress Failure

Maximum Tensile Stress Pa	Maximum Shear Stress Pa
3.45e+007	1.01e+023

TABLE 37
POLYURETH > Color

Red	Green	Blue
235	209	184

TABLE 38
POLYURETH > Isotropic Elasticity

Young's Modulus Pa	Poisson's Ratio	Bulk Modulus Pa	Shear Modulus Pa	Temperature C
3.2e+007	0.49	5.3333e+008	1.0738e+007	

CONCRETE-L

TABLE 39
CONCRETE-L > Constants

Density	2440 kg m^-3

TABLE 40
CONCRETE-L > Solid Density Linear

Solid Density kg m^-3	
2440	
Pressure Pa	Density kg m^-3

0	2340
2.5e+007	2350
7.e+007	2400
1.3e+008	2460
2.5e+008	2500
Soundspeed m s^-1	Density kg m^-3
2200	2340
2200	2440

TABLE 41
CONCRETE-L > Drucker-Prager Strength Piecewise

Pressure P Pa	Yield Stress Y Pa
0	2.5e+007
8.e+007	1.1e+008
1.1e+008	1.6e+008
2.e+008	1.95e+008

TABLE 42
CONCRETE-L > Shear Modulus

Shear Modulus Pa
7.88e+009

TABLE 43
CONCRETE-L > Tensile Pressure Failure

Maximum Tensile Pressure Pa
-2.5e+006

TABLE 44
CONCRETE-L > Color

Red	Green	Blue
103	192	205

TABLE 45
CONCRETE-L > Isotropic Elasticity

Young's Modulus Pa	Poisson's Ratio	Bulk Modulus Pa	Shear Modulus Pa	Temperature C
2.5e+010	0.25	1.6667e+010	1.e+010	