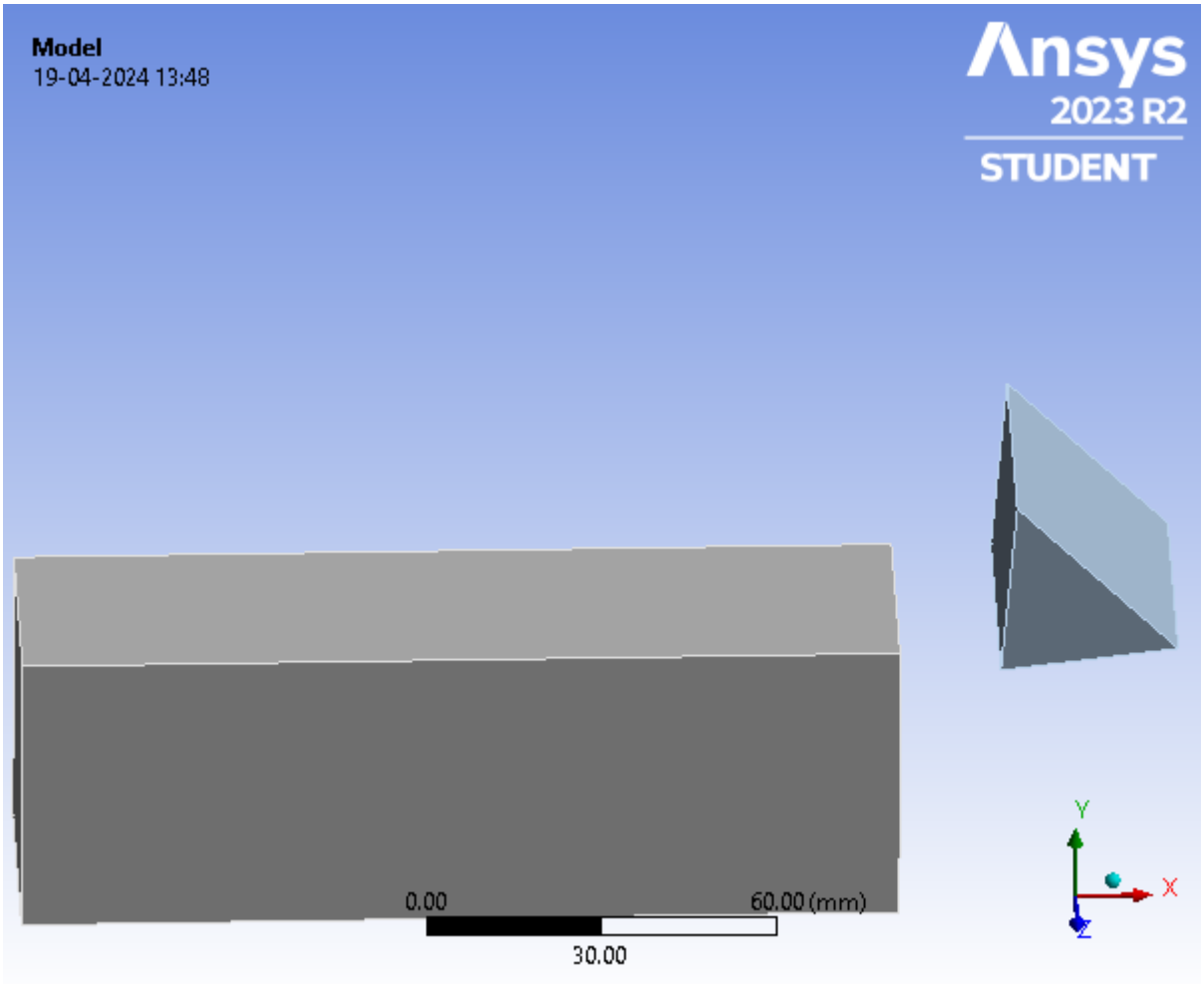
BATCH 34*

First Saved	Friday, April 19, 2024
Last Saved	Friday, April 19, 2024
Product Version	2023 R2
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)

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\JANU\OneDrive\Desktop\R1\R@rake angle 20_files\dp0\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\JANU\OneDrive\Desktop\R1\R@rake angle 20_files\dp0\SYS\DM\SYS.agdb
Type	DesignModeler
Length Unit	Meters
Display Style	Body Color
Bounding Box	
Length X	197.38 mm
Length Y	79.162 mm
Length Z	46. mm
Properties	
Volume	3.2147e+005 mm³
Mass	1.2556 kg
Scale Factor Value	1.
Statistics	
Bodies	2
Active Bodies	2
Nodes	39473
Elements	35126
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 > Body Groups

Object Name	*Part*
State	Meshed
Graphics Properties	
Visible	Yes
Definition	
Suppressed	No
Assignment	Multiple Materials
Coordinate System	Default Coordinate System
Bounding Box	
Length X	197.38 mm
Length Y	79.162 mm
Length Z	46. mm
Properties	
Volume	3.2147e+005 mm³
Mass	1.2556 kg
Centroid X	34.028 mm
Centroid Y	11.428 mm
Centroid Z	-6.6026e-017 mm
Moment of Inertia Ip1	485.1 kg·mm²
Moment of Inertia Ip2	4961.3 kg·mm²
Moment of Inertia Ip3	5076. kg·mm²
Statistics	
Nodes	39473
Elements	35126
Mesh Metric	None

TABLE 6
Model (A4) > Geometry > Part > Parts

Object Name	*Solid*	*Solid*
State	Meshed	
Graphics Properties		
Visible	Yes	
Transparency	1	
Definition		
Suppressed	No	
Stiffness Behavior	Flexible	
Coordinate System	Default Coordinate System	
Reference Temperature	By Environment	
Reference Frame	Lagrangian	
Material		

Assignment	AL 7075-T6	TUNGSTEN
Bounding Box		
Length X	150. mm	30.284 mm
Length Y	50. mm	31.162 mm
Length Z	40. mm	46. mm
Properties		
Volume	3.e+005 mm³	21472 mm³
Mass	0.8412 kg	0.41441 kg
Centroid X	-1.4117e-015 mm	103.1 mm
Centroid Y	2.3529e-016 mm	34.627 mm
Centroid Z	-7.0586e-016 mm	1.2328e-015 mm
Moment of Inertia Ip1	287.41 kg·mm²	99.208 kg·mm²
Moment of Inertia Ip2	1689.4 kg·mm²	86.33 kg·mm²
Moment of Inertia Ip3	1752.5 kg·mm²	39.391 kg·mm²
Statistics		
Nodes	36000	3473
Elements	32376	2750
Mesh Metric	None	

TABLE 7
Model (A4) > Materials

Object Name	*Materials*
State	Fully Defined
Statistics	
Materials	5
Material Assignments	0

Coordinate Systems

TABLE 8
Model (A4) > Coordinate Systems > Coordinate System

Object Name	*Global Coordinate System*	*Coordinate System*	*Coordinate System 2*
State	Fully Defined		
Definition			
Type	Cartesian		
Suppressed		No	
Origin			
Origin X	0. mm	-75. mm	103.1 mm
Origin Y	0. mm	-25. mm	34.627 mm
Origin Z	0. mm	20. mm	1.2328e-015 mm
Define By		Geometry Selection	
Geometry		Defined	
Directional Vectors			
X Axis Data	[1. 0. 0.]		
Y Axis Data	[0. 1. 0.]		
Z Axis Data	[0. 0. 1.]		
Principal Axis			
Axis		X	
Define By		Global X Axis	
Orientation About Principal Axis			
Axis		Y	

Define By		Default	
Transformations			
Base Configuration		Absolute	
Transformed Configuration		[-75. -25. 20.]	[103.1 34.627 1.2328e-015]

Connections

TABLE 9
Model (A4) > Connections

Object Name	*Connections*
State	Fully Defined
Auto Detection	
Generate Automatic Connection On Refresh	Yes
Transparency	
Enabled	Yes
Statistics	
Contacts	1
Active Contacts	1
Joints	0
Active Joints	0
Beams	0
Active Beams	0
Bearings	0
Active Bearings	0
Springs	0
Active Springs	0
Body Interactions	1
Active Body Interactions	1

TABLE 10
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	0.54395 mm
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	1
Active Connections	1

TABLE 11
Model (A4) > Connections > Contacts > Contact Regions

Object Name	*Frictional - Solid To Solid*
State	Fully Defined
Scope	
Scoping Method	Geometry Selection
Contact	1 Body
Target	1 Body
Contact Bodies	Solid
Target Bodies	Solid
Protected	No
Definition	
Type	Frictional
Friction Coefficient	0.41
Dynamic Coefficient	0.22
Decay Constant	0.
Scope Mode	Manual
Behavior	Program Controlled
Trim Contact	Program Controlled
Suppressed	No

TABLE 12
Model (A4) > Connections > Body Interactions

Object Name	*Body Interactions*
State	Fully Defined
Advanced	
Contact Detection	Trajectory
Formulation	Penalty
Sliding Contact	Discrete Surface
Body Self Contact	Program Controlled
Element Self Contact	Program Controlled
Tolerance	0.2

TABLE 13
Model (A4) > Connections > Body Interactions > Body Interaction

Object Name	*Body Interaction*
State	Fully Defined
Scope	
Scoping Method	Geometry Selection
Geometry	All Bodies
Definition	
Type	Frictional
Friction Coefficient	0.41
Dynamic Coefficient	0.22
Decay Constant	0.
Suppressed	No

Mesh

TABLE 14
Model (A4) > Mesh

Object Name	*Mesh*
State	Solved
Display	
Display Style	Use Geometry Setting
Defaults	
Physics Preference	Explicit
Element Order	Linear
Element Size	Default (5.4395 mm)
Sizing	
Use Adaptive Sizing	No
Growth Rate	Default (1.5)
Max Size	Default (5.4395 mm)
Mesh Defeaturing	Yes
Defeature Size	Default (0.54395 mm)
Capture Curvature	Yes
Curvature Min Size	Default (2.7198 mm)
Curvature Normal Angle	Default (72.0°)
Capture Proximity	No
Bounding Box Diagonal	217.58 mm
Average Surface Area	3324.1 mm²
Minimum Edge Length	30.511 mm
Quality	
Check Mesh Quality	Yes, Errors and Warnings
Target Element Quality	Default (0.2)
Target Characteristic Length (LS-DYNA)	Default (0.54395 mm)
Target Aspect Ratio (Explicit)	Default (5.0)
Smoothing	High
Mesh Metric	None
Inflation	
Use Automatic Inflation	None
Inflation Option	Smooth Transition
Transition Ratio	0.272
Maximum Layers	1
Growth Rate	1.2
Inflation Algorithm	Pre
View Advanced Options	No
Advanced	
Number of CPUs for Parallel Part Meshing	Program Controlled
Straight Sided Elements	
Rigid Body Behavior	Full Mesh
Triangle Surface Mesher	Program Controlled
Topology Checking	Yes
Pinch Tolerance	Default (2.4478 mm)
Generate Pinch on Refresh	No
Statistics	
Nodes	39473
Elements	35126
Show Detailed Statistics	No

TABLE 15
Model (A4) > Mesh > Mesh Controls

Object Name	*Body Sizing*
State	Fully Defined
Scope	
Scoping Method	Geometry Selection
Geometry	2 Bodies
Definition	
Suppressed	No
Type	Element Size
Element Size	2.0 mm
Advanced	
Defeature Size	Default (0.54395 mm)
Growth Rate	Default (1.5)
Capture Curvature	Yes
Curvature Normal Angle	Default (72.0°)
Local Min Size	Default (2.0 mm)
Capture Proximity	No

Explicit Dynamics (A5)

TABLE 16
Model (A4) > Analysis

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

TABLE 17
Model (A4) > Explicit Dynamics (A5) > Initial Conditions

Object Name	*Initial Conditions*
State	Fully Defined

TABLE 18
Model (A4) > Explicit Dynamics (A5) > Initial Conditions > Initial Condition

Object Name	*Pre-Stress (None)*
State	Fully Defined
Definition	
Pre-Stress Environment	None Available
Pressure Initialization	From Deformed State

TABLE 19
Model (A4) > Explicit Dynamics (A5) > Analysis Settings

Object Name	*Analysis Settings*
State	Fully Defined
Analysis Settings Preference	
Type	Program Controlled

Step Controls	
Number Of Steps	1
Current Step Number	1
Load Step Type	Explicit Time Integration
End Time	5.e-004 s
Resume From Cycle	0
Maximum Number of Cycles	1e+07
Maximum Energy Error	0.1
Reference Energy Cycle	0
Initial Time Step	Program Controlled
Minimum Time Step	Program Controlled
Maximum Time Step	Program Controlled
Time Step Safety Factor	0.9
Characteristic Dimension	Diagonals
Automatic Mass Scaling	No
Solver Controls	
Solve Units	mm, mg, ms
Beam Solution Type	Bending
Beam Time Step Safety Factor	0.5
Hex Integration Type	Exact
Shell Sublayers	3
Shell Shear Correction Factor	0.8333
Shell BWC Warp Correction	Yes
Shell Thickness Update	Nodal
Tet Integration	Average Nodal Pressure
Shell Inertia Update	Recompute
Density Update	Program Controlled
Minimum Timestep for SPH	1.e-010 s
Minimum Density Factor for SPH	0.2
Maximum Density Factor for SPH	3.
Density Cutoff Option For SPH	Limit Density
Minimum Velocity	1.e-003 mm s^-1
Maximum Velocity	1.e+013 mm s^-1
Radius Cutoff	1.e-003
Minimum Strain Rate Cutoff	1.e-010
Detonation Point Burn Type	Program Controlled
Euler Domain Controls	
Domain Size Definition	Program Controlled
Display Euler Domain	Yes
Scope	All Bodies
X Scale factor	1.2
Y Scale factor	1.2
Z Scale factor	1.2
Domain Resolution Definition	Total Cells
Total Cells	2.5e+05
Lower X Face	Flow Out
Lower Y Face	Flow Out
Lower Z Face	Flow Out
Upper X Face	Flow Out

Upper Y Face	Flow Out
Upper Z Face	Flow Out
Euler Tracking	By Body
Damping Controls	
Linear Artificial Viscosity	0.2
Quadratic Artificial Viscosity	1.
Linear Viscosity in Expansion	No
Artificial Viscosity For Shells	Yes
Linear Artificial Viscosity for SPH	1.
Quadratic Artificial Viscosity for SPH	1.
Hourglass Damping	AUTODYN Standard
Viscous Coefficient	0.1
Static Damping	0.
Erosion Controls	
On Geometric Strain Limit	Yes
Geometric Strain Limit	1.5
On Material Failure	Yes
On Minimum Element Time Step	No
Retain Inertia of Eroded Material	Yes
Output Controls	
Step-aware Output Controls	No
Save Results on	Equally Spaced Points
Result Number Of Points	20
Save Restart Files on	Equally Spaced Points
Restart Number Of Points	5
Save Result Tracker Data on	Cycles
Tracker Cycles	1
Output Contact Forces	Off
Analysis Data Management	
Solver Files Directory	C:\Users\JANU\OneDrive\Desktop\R1\R@rake angle 20_files\dp0\SYS\MECH\
Scratch Solver Files Directory	

TABLE 20
Model (A4) > Explicit Dynamics (A5) > Loads

Object Name	*Displacement*	*Displacement 2*
State	Fully Defined	
Scope		
Scoping Method	Geometry Selection	
Geometry	5 Faces	1 Face
Definition		
Type	Displacement	
Define By	Components	
Coordinate System	Coordinate System 2	Coordinate System
X Component	-180. mm (ramped)	0. mm (ramped)
Y Component	0. mm (ramped)	
Z Component	0. mm (ramped)	
Suppressed	No	

FIGURE 1
Model (A4) > Explicit Dynamics (A5) > Displacement

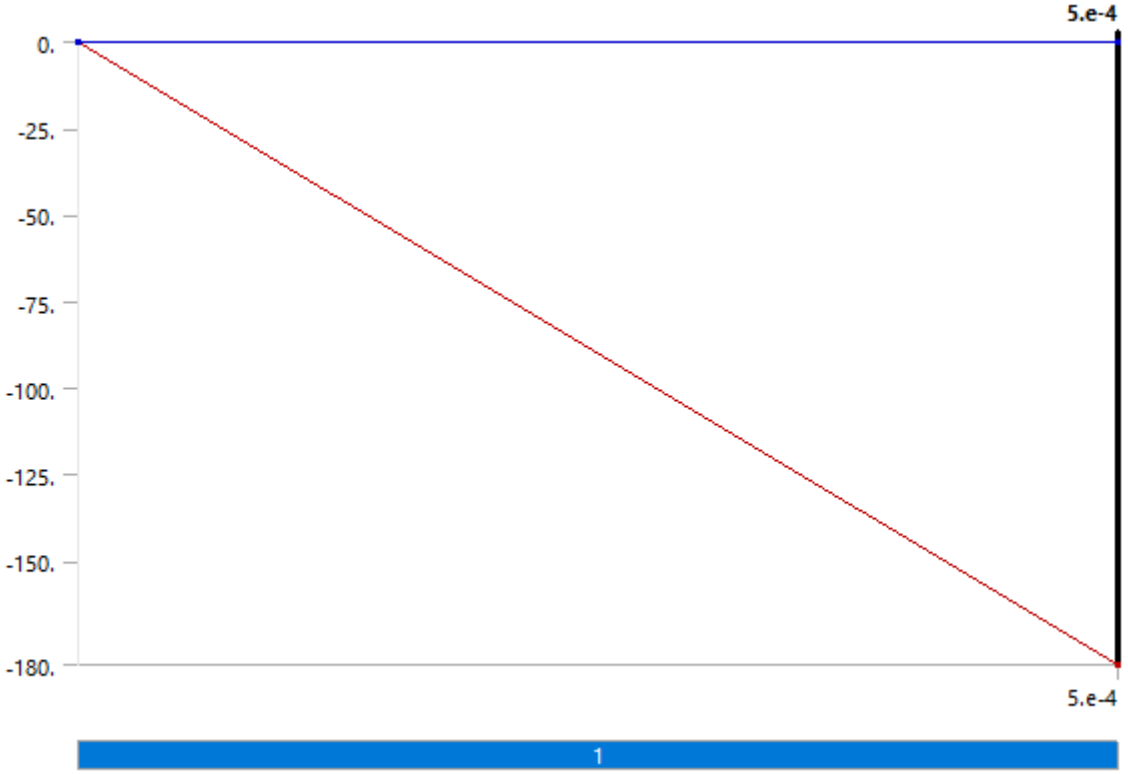
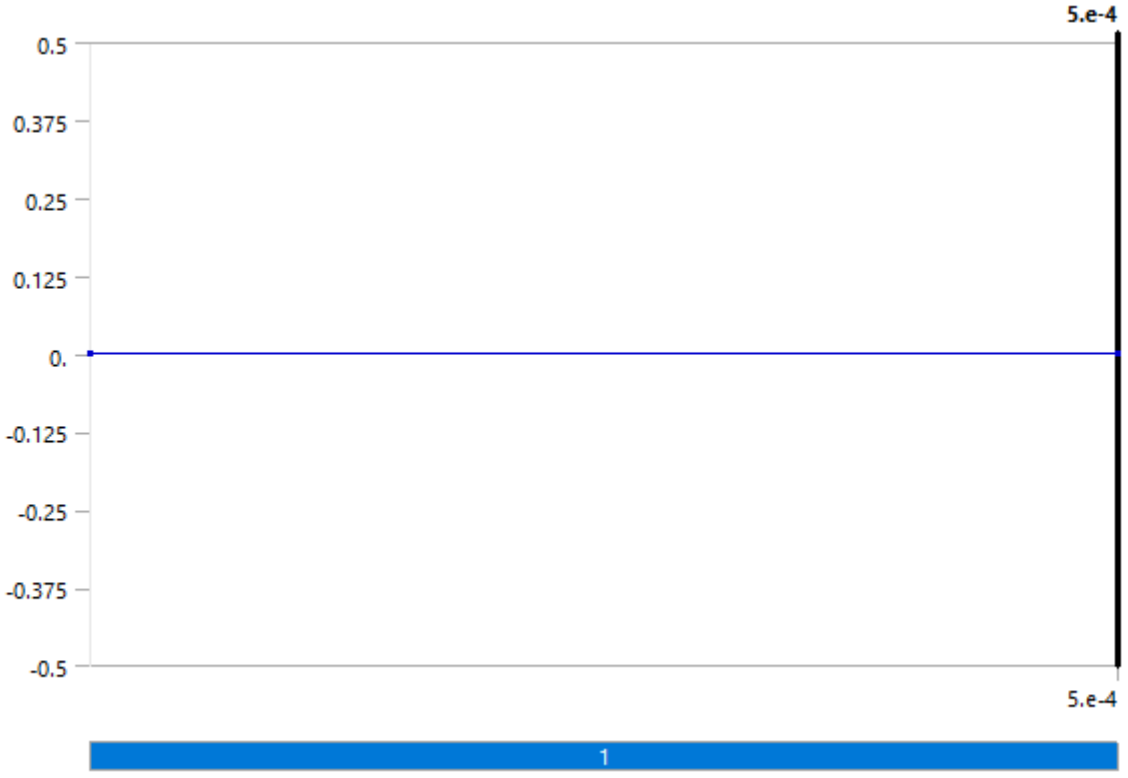


FIGURE 2
Model (A4) > Explicit Dynamics (A5) > Displacement 2



Solution (A6)

TABLE 21
Model (A4) > Explicit Dynamics (A5) > Solution

Object Name	*Solution (A6)*
State	Solved
Information	
Status	Done
Post Processing	
Beam Section Results	No

TABLE 22
Model (A4) > Explicit Dynamics (A5) > Solution (A6) > Solution Information

Object Name	*Solution Information*
State	Solved
Solution Information	
Solution Output	Solver Output
Update Interval	2.5 s
Display Points	All
Display Filter During Solve	Yes

TABLE 23
Model (A4) > Explicit Dynamics (A5) > Solution (A6) > Results

Object Name	*Total Deformation*	*Maximum Shear Stress*
State	Solved	
Scope		
Scoping Method	Geometry Selection	
Geometry	All Bodies	
Definition		
Type	Total Deformation	Maximum Shear Stress
By	Time	
Display Time	Last	
Separate Data by Entity	No	
Calculate Time History	Yes	
Identifier		
Suppressed	No	
Results		
Minimum	0. mm	0.38649 MPa
Maximum	291.94 mm	998.23 MPa
Average	23.127 mm	107.54 MPa
Minimum Occurs On	Solid	
Maximum Occurs On	Solid	
Minimum Value Over Time		
Minimum	0. mm	0. MPa
Maximum	0. mm	10.59 MPa
Maximum Value Over Time		
Minimum	0. mm	0. MPa
Maximum	291.94 mm	1448.6 MPa
Information		
Time	5.0001e-004 s	
Set	21	
Cycle Number	17251	
Integration Point Results		
Display Option		Averaged
Average Across Bodies		No

FIGURE 3
Model (A4) > Explicit Dynamics (A5) > Solution (A6) > Total Deformation

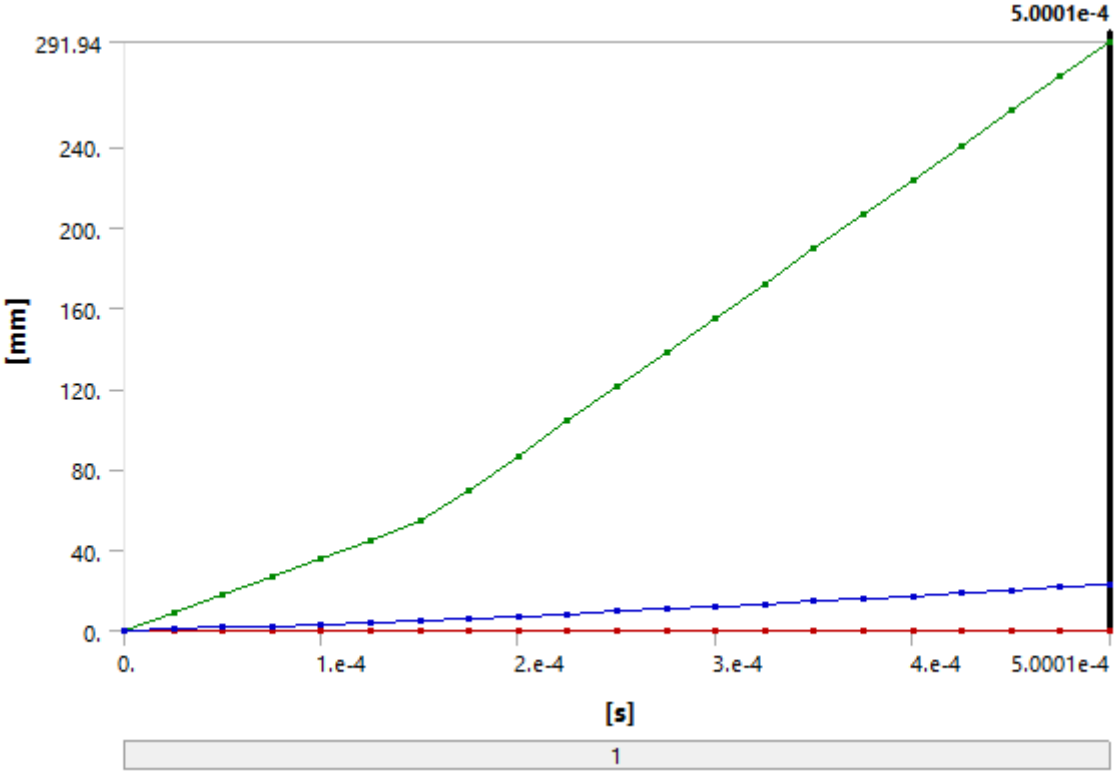


TABLE 24
Model (A4) > Explicit Dynamics (A5) > Solution (A6) > Total Deformation

Time [s]	Minimum [mm]	Maximum [mm]	Average [mm]
1.1755e-038	0.	0.	0.
2.5001e-005		9.1284	0.79107
5.0049e-005		18.147	1.5862
7.5009e-005		27.15	2.4733
1.0003e-004		36.145	3.3501
1.2501e-004		45.136	4.2295
1.5e-004		54.133	5.2174
1.7502e-004		69.778	6.2035
2.0002e-004		86.847	7.2213
2.2501e-004		103.91	8.3518
2.5001e-004		121.	9.4602
2.7501e-004		138.08	10.625
3.0001e-004		155.18	11.881
3.2501e-004		172.27	13.12
3.5e-004		189.36	14.431
3.75e-004		206.45	15.809
4.0003e-004		223.56	17.204
4.2501e-004		240.65	18.66
4.5003e-004		257.76	20.145
4.7503e-004		274.85	21.642
5.0001e-004		291.94	23.127

FIGURE 4
Model (A4) > Explicit Dynamics (A5) > Solution (A6) > Maximum Shear Stress

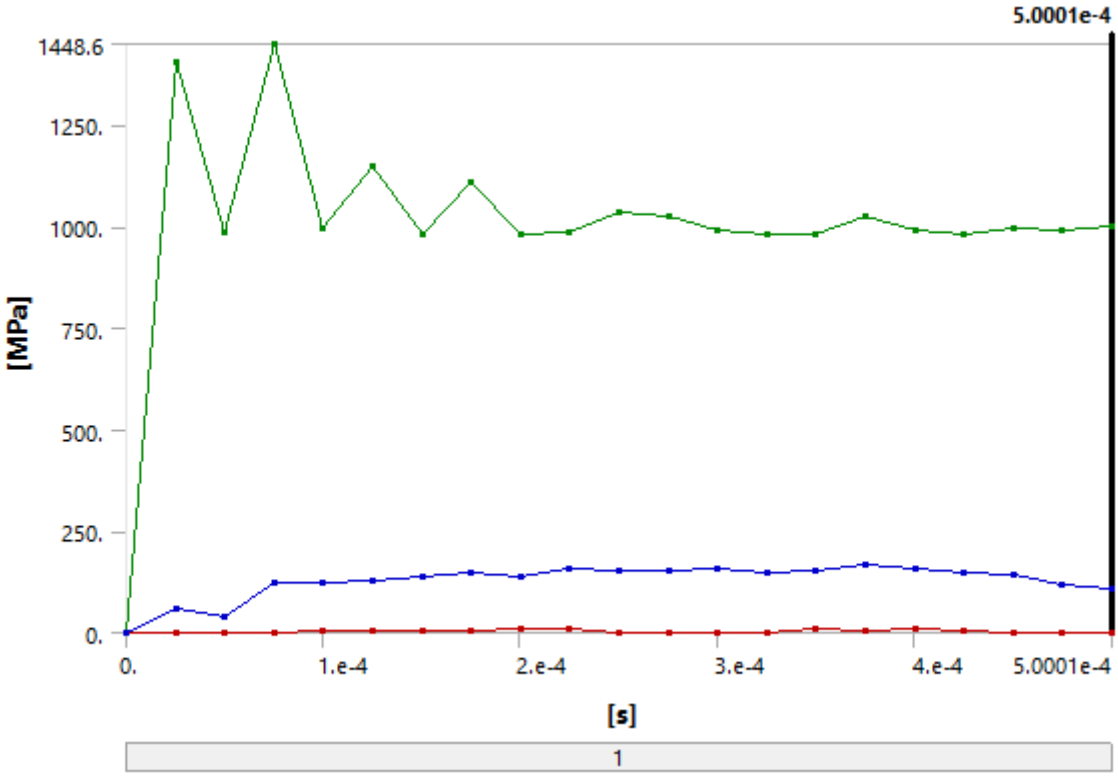


TABLE 25
Model (A4) > Explicit Dynamics (A5) > Solution (A6) > Maximum Shear Stress

Time [s]	Minimum [MPa]	Maximum [MPa]	Average [MPa]
1.1755e-038	0.	0.	0.
2.5001e-005		1402.2	60.13
5.0049e-005		984.7	41.604
7.5009e-005	1.9008	1448.6	124.55
1.0003e-004	2.5359	995.98	123.02
1.2501e-004	5.247	1149.1	127.09
1.5e-004	4.4942	979.52	138.86
1.7502e-004	5.0679	1109.8	147.16
2.0002e-004	7.4854	979.91	139.87
2.2501e-004	10.59	984.93	157.13
2.5001e-004	0.	1036.1	150.8
2.7501e-004		1024.2	151.93
3.0001e-004		991.14	158.94
3.2501e-004		980.93	149.99
3.5e-004	9.8261	979.04	153.36
3.75e-004	6.6177	1023.3	167.42
4.0003e-004	9.7715	991.4	157.09
4.2501e-004	5.5908	980.52	149.42
4.5003e-004	1.9088	994.46	143.69
4.7503e-004	0.83286	988.56	120.19
5.0001e-004	0.38649	998.23	107.54

Material Data

AL 7075-T6

TABLE 26
AL 7075-T6 > Constants

Density	2.804e-006 kg mm^-3
Specific Heat	8.48e+005 mJ kg^-1 C^-1

TABLE 27
AL 7075-T6 > Shock EOS Linear

Gruneisen Coefficient	Parameter C1 mm s^-1	Parameter S1	Parameter Quadratic S2 s mm^-1
2.2	5.2e+006	1.36	0

TABLE 28
AL 7075-T6 > Steinberg Guinan Strength

Initial Yield Stress Y MPa	Maximum Yield Stress Ymax MPa	Hardening Constant B	Hardening Exponent n	Derivative dG/dP G'P	Derivative dG/dT G'T MPa C^-1	Derivative dY/dP Y'P	Melting Temperature Tmelt C
420	810	965	0.1	1.741	-16.45	2.738e-002	946.85

TABLE 29
AL 7075-T6 > Shear Modulus

Shear Modulus MPa
26700

TABLE 30
AL 7075-T6 > Color

Red	Green	Blue
181	155	130

TUNGSTEN

TABLE 31
TUNGSTEN > Constants

Density	1.93e-005 kg mm^-3
Specific Heat	1.29e+005 mJ kg^-1 C^-1

TABLE 32
TUNGSTEN > Shock EOS Linear

Gruneisen Coefficient	Parameter C1 mm s^-1	Parameter S1	Parameter Quadratic S2 s mm^-1
1.67	4.03e+006	1.237	0

TABLE 33
TUNGSTEN > Steinberg Guinan Strength

Initial Yield Stress Y MPa	Maximum Yield Stress Ymax MPa	Hardening Constant B	Hardening Exponent n	Derivative dG/dP G'P	Derivative dG/dT G'T MPa C^-1	Derivative dY/dP Y'P	Melting Temperature Tmelt C
2200	4000	7.7	0.13	1.501	-22.08	2.064e-002	4246.9

TABLE 34
TUNGSTEN > Shear Modulus

Shear Modulus MPa
1.6e+005

TABLE 35
TUNGSTEN > Color

Red	Green	Blue
184	235	197