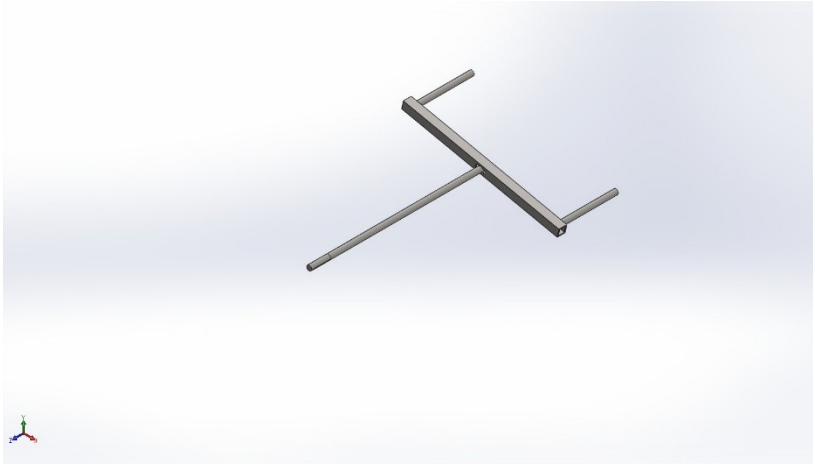

Simulation of Tilty Loader

Date: Tuesday, December 9, 2025
Designer: Solidworks
Study name: Static 1
Analysis type: Static

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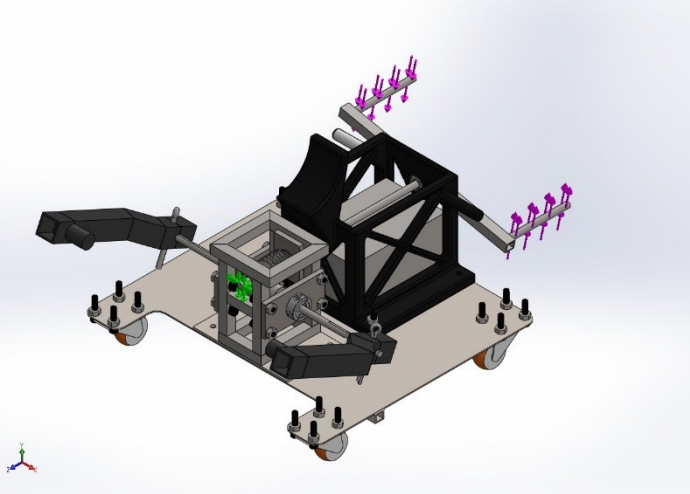
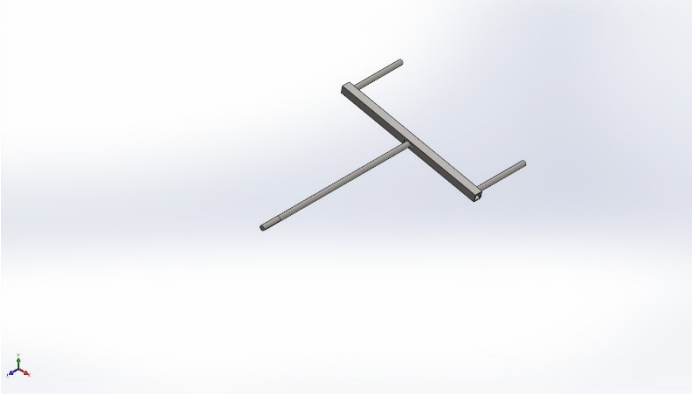
Description

No Data

Assumptions

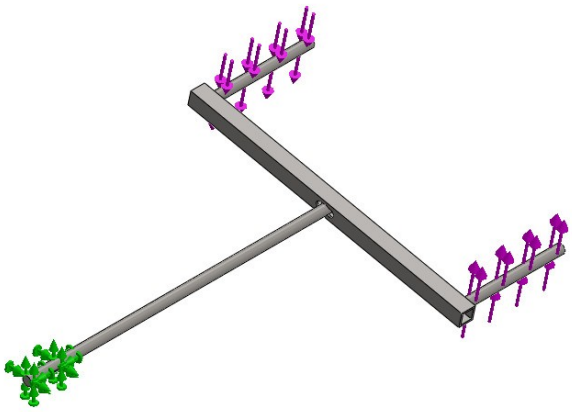


Original Model



Model Analyzed

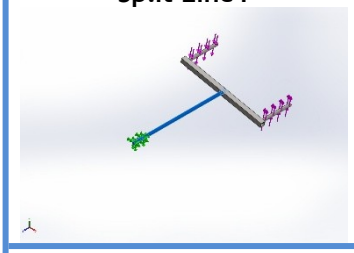
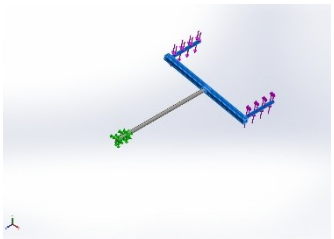
Model Information



Model name: Tilty Loader

Current Configuration: Open

Solid Bodies

Document Name and Reference	Treated As	Volumetric Properties	Document Path/Date Modified
Split Line1 	Solid Body	Mass:0.112921 kg Volume:1.42938e-05 m^3 Density:7,900 kg/m^3 Weight:1.10663 N	G:\.shortcut-targets-by-id\1zACeN3N5D587UYBW02SNql2ed6qllvch\387 Team Project\CAD\Tilty Loader\HandleShaft.SLDPRT Dec 9 11:17:27 2025
Cut-Extrude1 	Solid Body	Mass:0.208788 kg Volume:2.64289e-05 m^3 Density:7,900 kg/m^3 Weight:2.04612 N	G:\.shortcut-targets-by-id\1zACeN3N5D587UYBW02SNql2ed6qllvch\387 Team Project\CAD\Tilty Loader\handleV2.SLDPRT Dec 8 13:12:49 2025

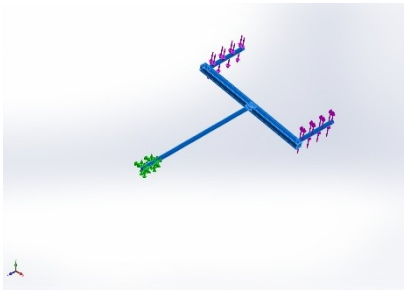
Study Properties

Study name	Static 1
Analysis type	Static
Mesh type	Solid Mesh
Thermal Effect:	On
Thermal option	Include temperature loads
Zero strain temperature	298 Kelvin
Include fluid pressure effects from SOLIDWORKS Flow Simulation	Off
Solver type	Automatic
Inplane Effect:	Off
Soft Spring:	Off
Inertial Relief:	Off
Incompatible bonding options	Automatic
Contact penalty stiffness scale factor	1
Large displacement	Off
Compute free body forces	On
Friction	Off
Use Adaptive Method:	Off
Result folder	SOLIDWORKS document (G:\.shortcut-targets-by-id\1zACeN3N5D587UYBW02SNqI2ed6qllvch\387 Team Project\CAD\Tilty Loader)

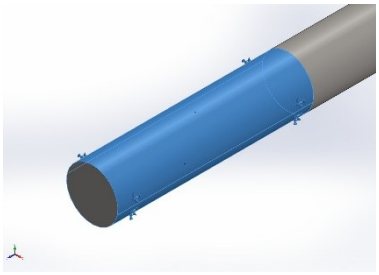
Units

Unit system:	SI (MKS)
Length/Displacement	mm
Temperature	Kelvin
Angular velocity	Rad/sec
Pressure/Stress	N/m^2

Material Properties

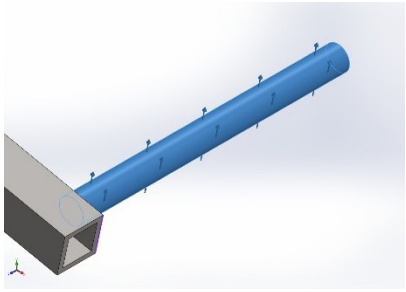
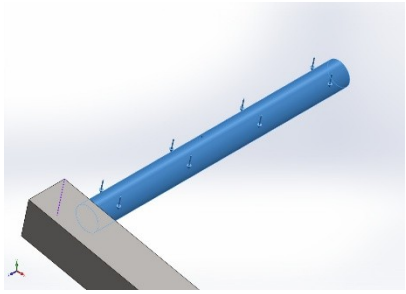
Model Reference	Properties	Components
	**Name:** AISI 1020 **Model type:** Linear Elastic Isotropic **Default failure criterion:** Max von Mises Stress **Yield strength:** 3.51571e+08 N/m^2 **Tensile strength:** 4.20507e+08 N/m^2 **Elastic modulus:** 2e+11 N/m^2 **Poisson's ratio:** 0.29 **Mass density:** 7,900 kg/m^3 **Shear modulus:** 7.7e+10 N/m^2 **Thermal expansion coefficient:** 1.5e-05 /Kelvin	SolidBody 1(Split Line1)(HandleShaft-1), SolidBody 1(Cut-Extrude1)(handleV2-1)
Curve Data:N/A		

Loads and Fixtures

Fixture name	Fixture Image	Fixture Details
Fixed-1		**Entities:** 2 face(s) **Type:** Fixed Geometry

Resultant Forces

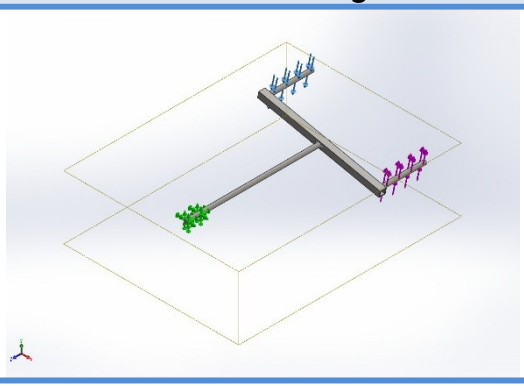
Components	X	Y	Z	Resultant
Reaction force(N)	-8.25802e-05	3.47541e-05	-1.11312e-06	8.96024e-05
Reaction Moment(N.m)	0	0	0	0

Load name	Load Image	Load Details
Force-1		**Entities:** 1 face(s) **Reference:** Edge< 1 > **Type:** Apply force **Values:** ---, ---, 7.5 lbf
Force-2		**Entities:** 1 face(s) **Reference:** Edge< 1 > **Type:** Apply force **Values:** ---, ---, -7.5 lbf

Connector Definitions

No Data

Interaction Information

Interaction	Interaction Image	Interaction Properties
Global Interaction		**Type:** Bonded **Components:** 1 component(s) **Options:** Independent mesh

Mesh information

Mesh type	Solid Mesh
Mesher Used:	Blended curvature-based mesh
Jacobian points for High quality mesh	16 Points
Maximum element size	0.092808 in
Minimum element size	0.0309357 in
Mesh Quality	High

Sensor Details

No Data

Resultant Forces

Reaction forces

Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	N	-8.25802e-05	3.47541e-05	-1.11312e-06	8.96024e-05

Reaction Moments

Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	N.m	0	0	0	0

Free body forces

Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	N	-0.000360979	8.03791e-05	-7.24543e-05	0.00037685

Free body moments

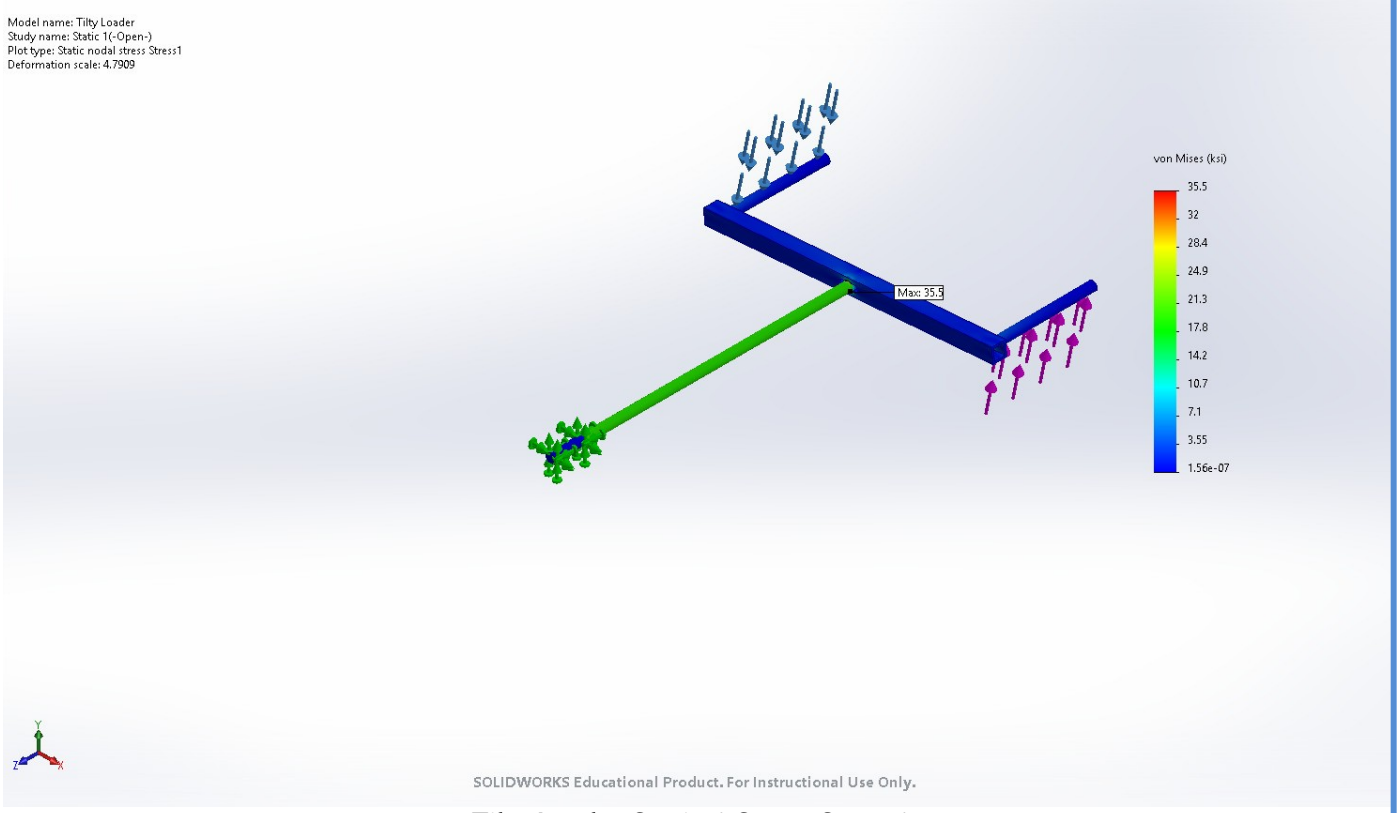
Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	N.m	0	0	0	1e-33

Beams

No Data

Study Results

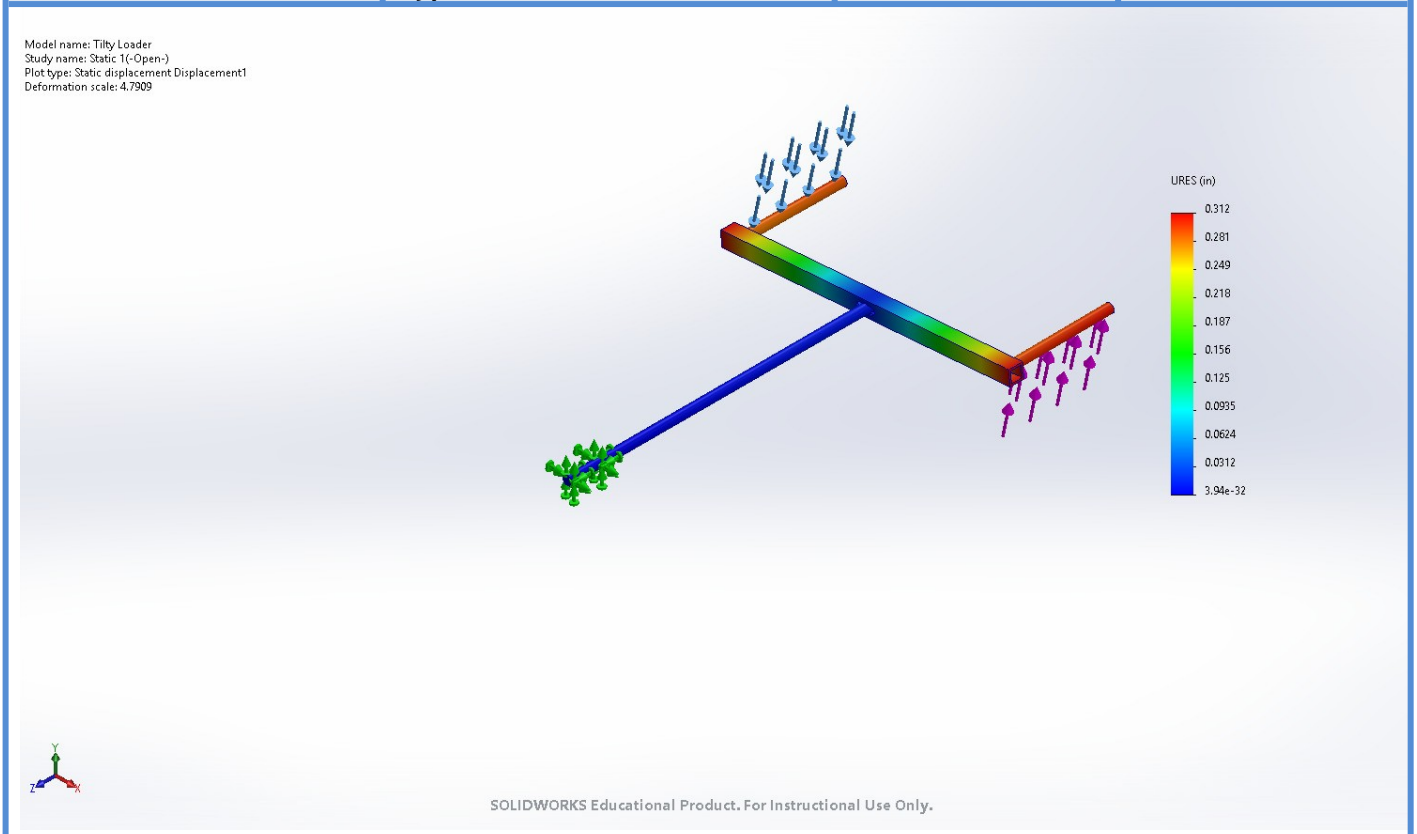
Name	Type	Min	Max
Stress1	VON: von Mises Stress	1.56e-07ksi Node: 3056	35.5ksi Node: 14494



Tilty Loader-Static 1-Stress-Stress1

Name	Type	Min	Max
Displacement1	URES: Resultant Displacement	0in Node: 1	0.312in Node: 15292

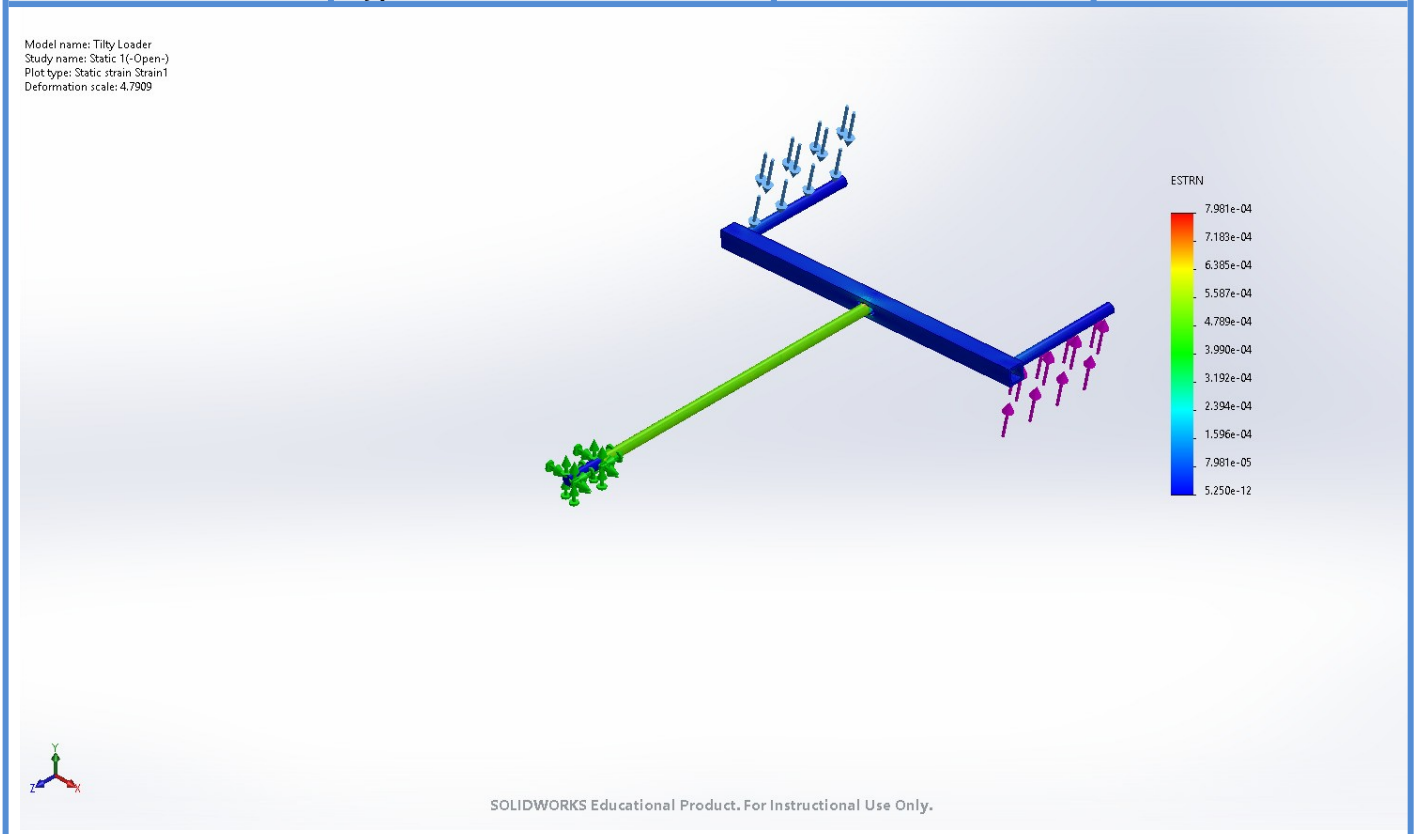
Name	Type	Min	Max



Tilty Loader-Static 1-Displacement-Displacement1

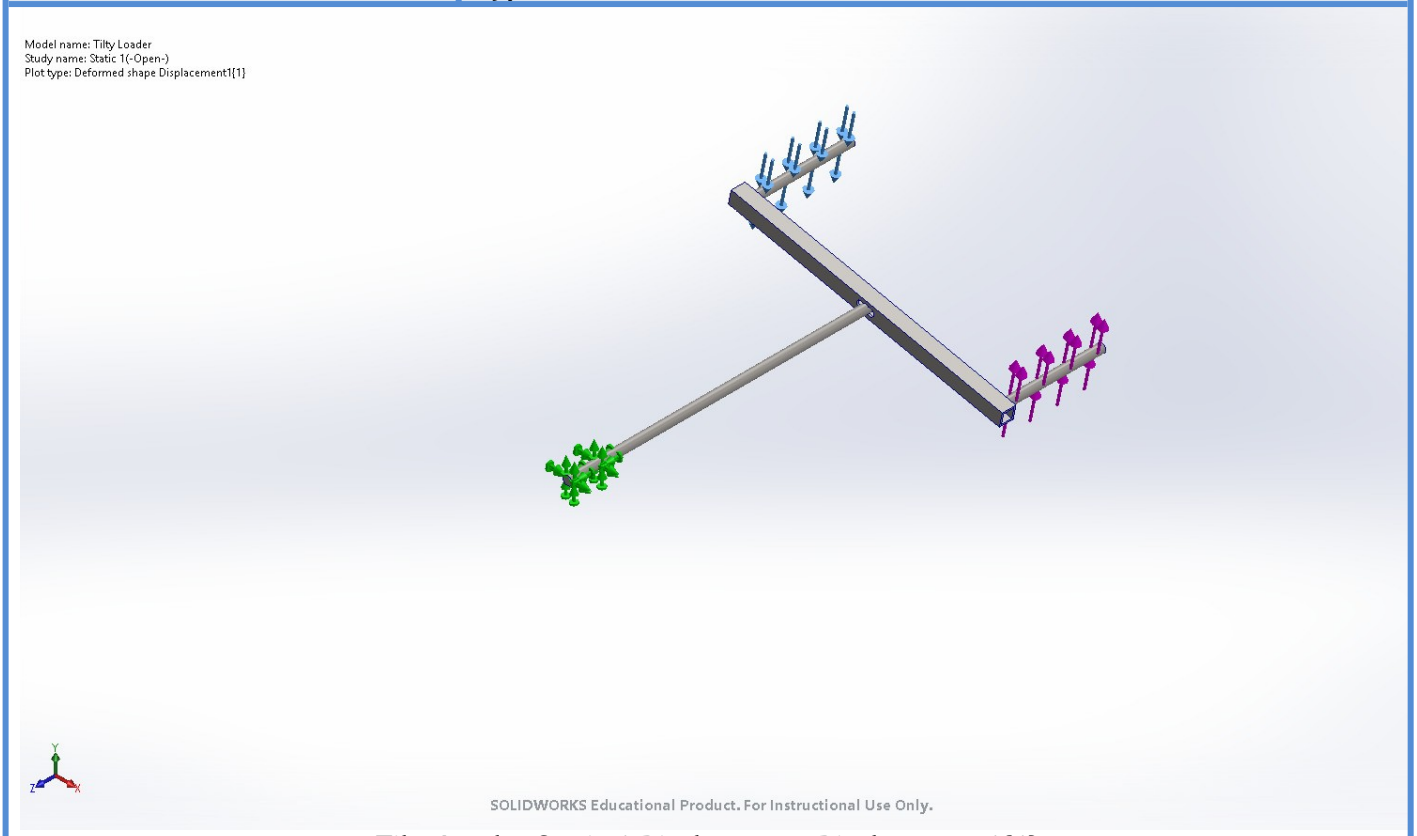
Name	Type	Min	Max
Strain1	ESTRN: Equivalent Strain	5.250e-12 Element: 1966	7.981e-04 Element: 6078

Name	Type	Min	Max



Tilty Loader-Static 1-Strain-Strain1

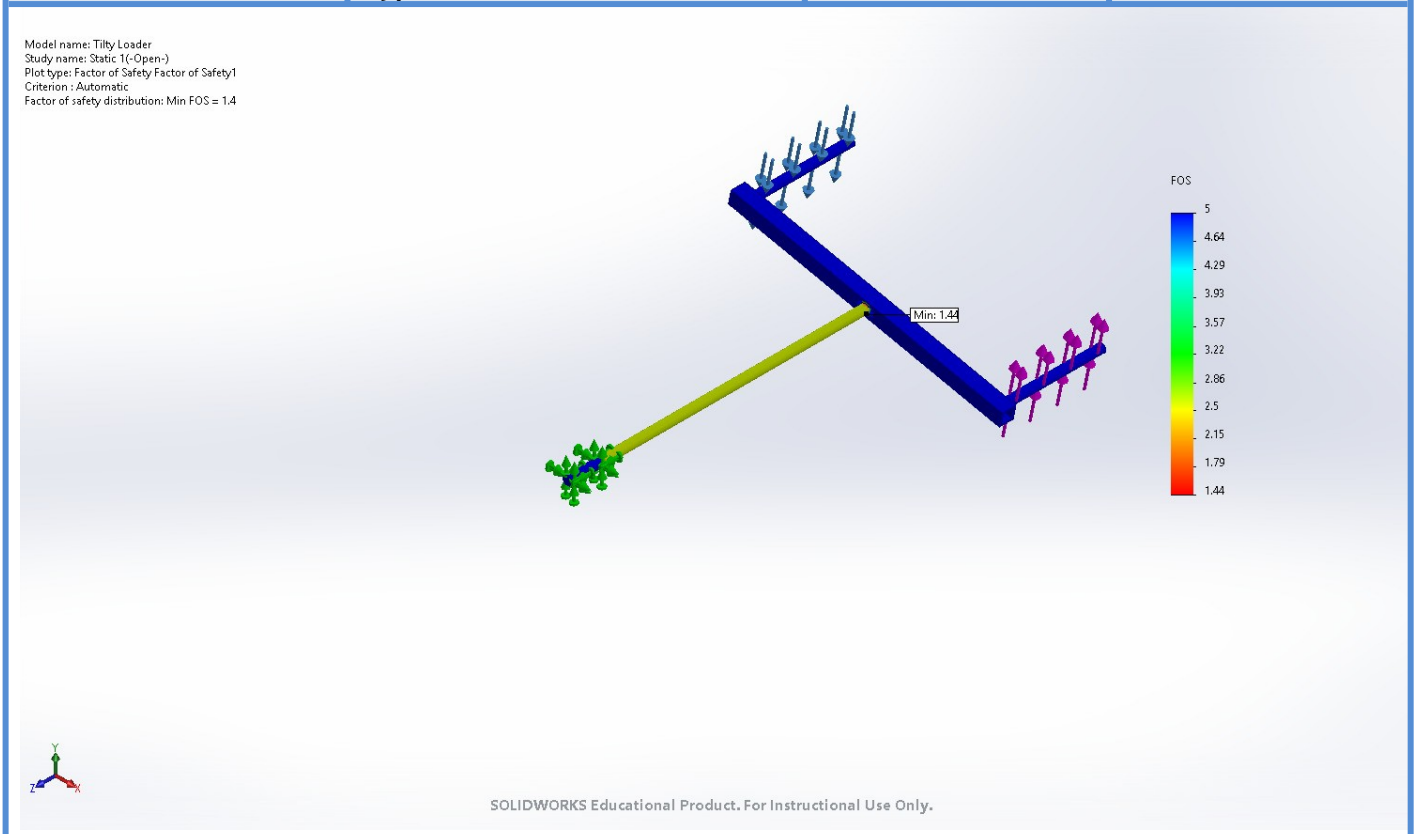
Name	Type
Displacement1{1}	Deformed shape

Name	Type
	

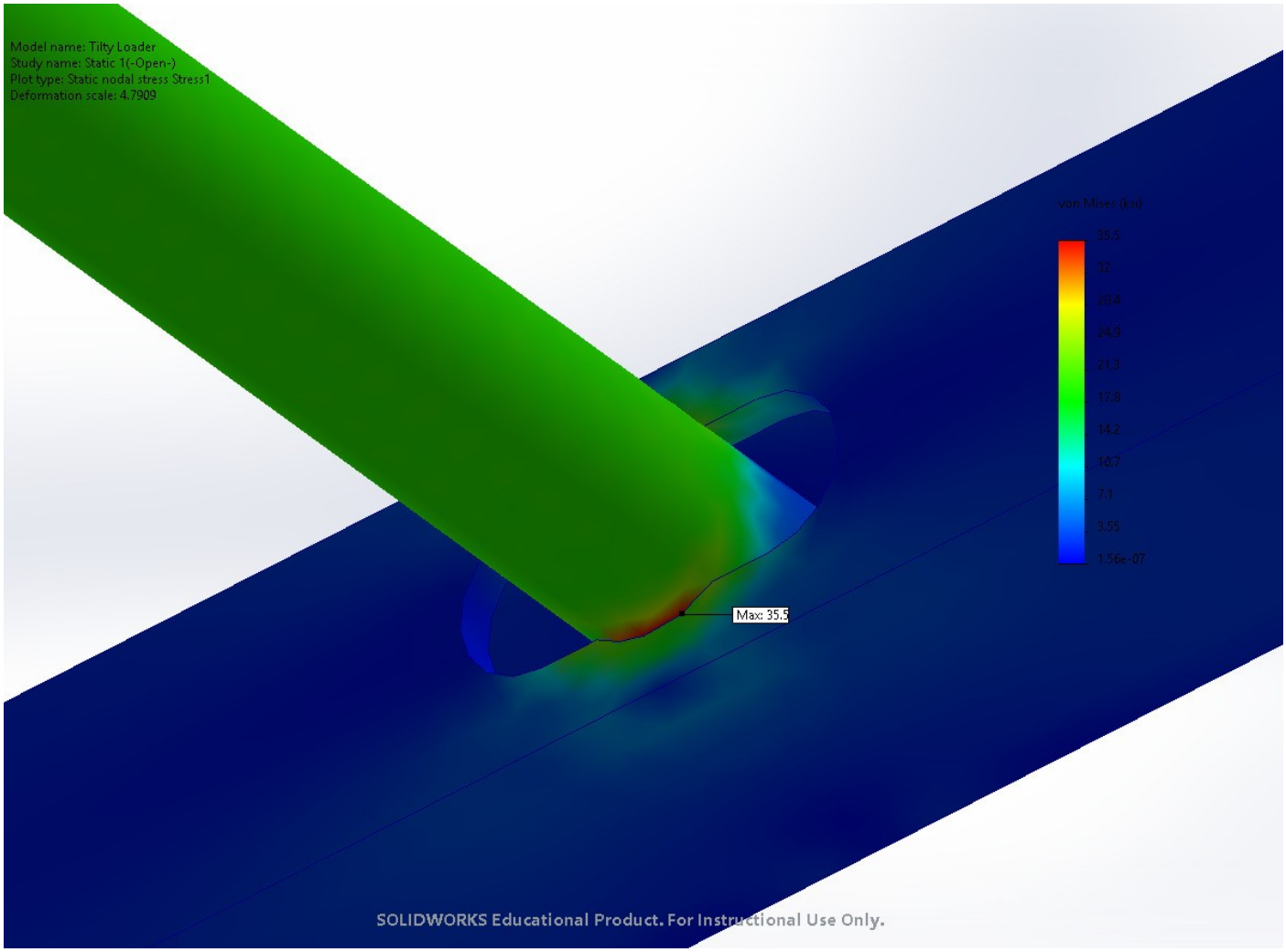
Tilty Loader-Static 1-Displacement-Displacement1{1}

Name	Type	Min	Max
Factor of Safety1	Automatic	1.44 Node: 14494	5 Node: 2

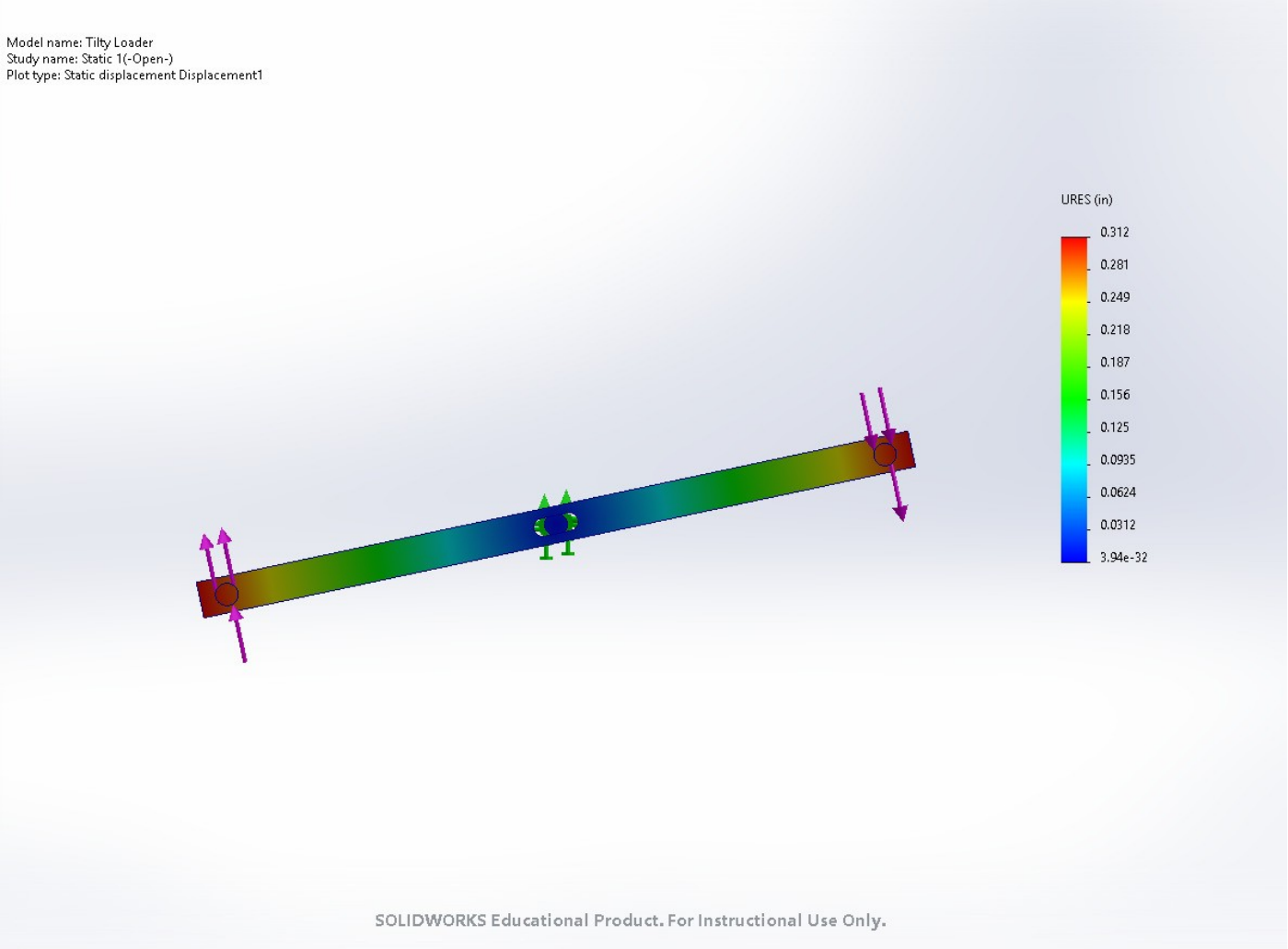
Name	Type	Min	Max



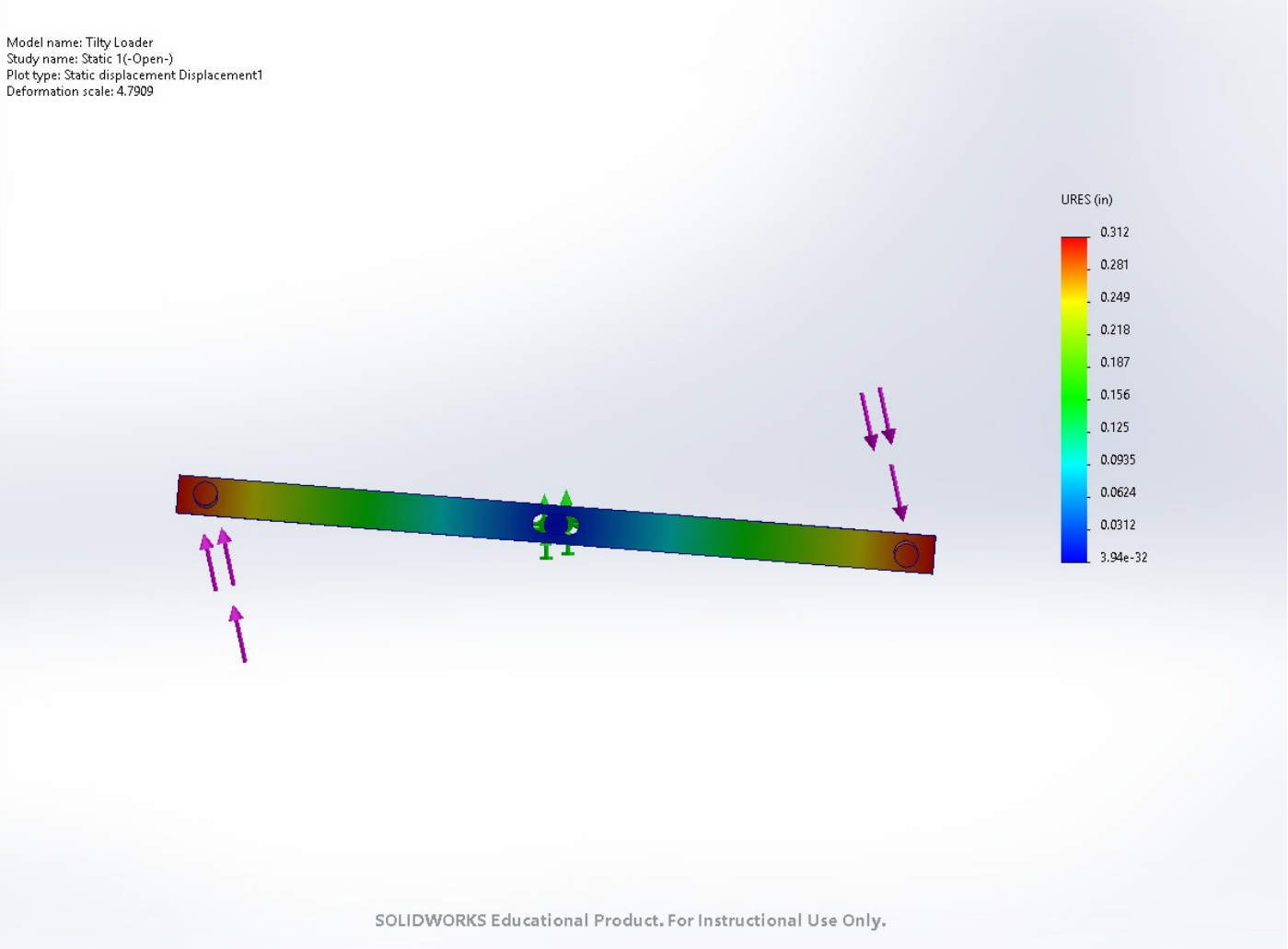
Tilty Loader-Static 1-Factor of Safety-Factor of Safety1


Model name: Tilty Loader
Study name: Static 1(-Open-)
Plot type: Static nodal stress Stress1
Deformation scale: 4.7909
von Mises (ksi)
35.5
32
28.4
24.9
21.3
17.8
14.2
10.7
7.1
3.55
1.56e-07
Max: 35.5
SOLIDWORKS Educational Product. For Instructional Use Only.

Max Stress

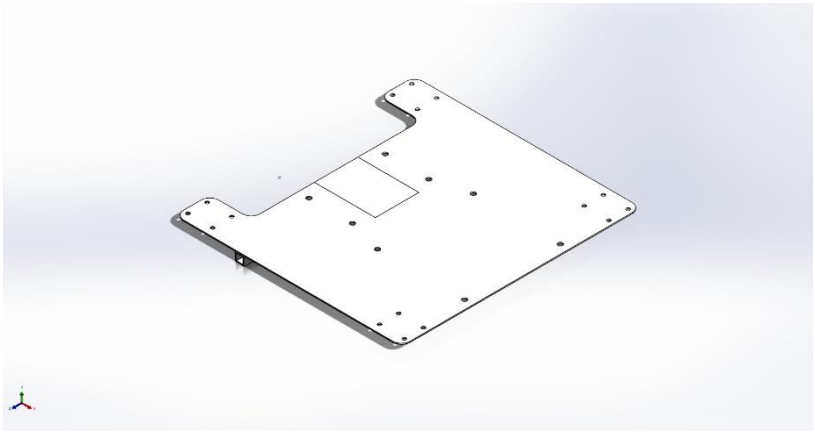


Before Deformation



After Deformation (Exaggerated)

Conclusion



Simulation of Base Plate

Date: Monday, December 8, 2025
Designer: Solidworks
Study name: Static 1
Analysis type: Static

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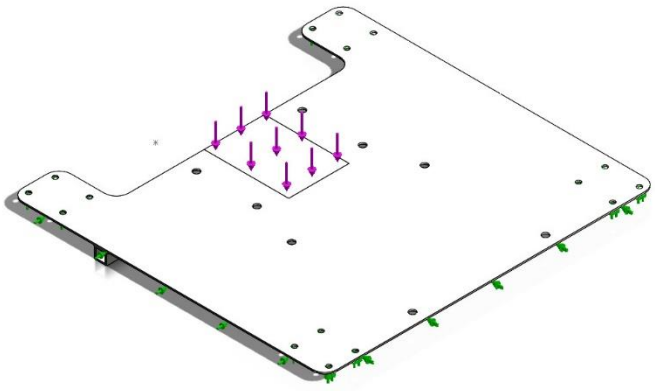
Description

No Data

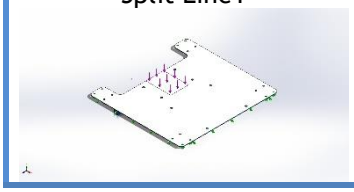
Assumptions

Model Information



Model name: Base Plate
Current Configuration: Default<As Machined>

Solid Bodies

Document Name and Reference	Treated As	Volumetric Properties	Document Path/Date Modified
Split Line1 	Solid Body	**Mass:1.74182 kg** **Volume:0.000220483 m^3** **Density:7,900 kg/m^3** **Weight:17.0698 N**	**C:\Users\masonbuehler\Downloads\CAD-20251208T223626Z-1-001\CAD\Tilty Loader\Base Plate.SLDPRT** Dec 8 17:25:41 2025

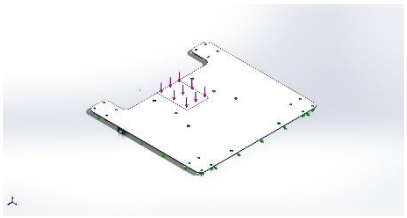
Study Properties

Study name	Static 1
Analysis type	Static
Mesh type	Solid Mesh
Thermal Effect:	On
Thermal option	Include temperature loads
Zero strain temperature	298 Kelvin
Include fluid pressure effects from SOLIDWORKS Flow Simulation	Off
Solver type	Automatic
Inplane Effect:	Off
Soft Spring:	Off
Inertial Relief:	Off
Incompatible bonding options	Automatic
Contact penalty stiffness scale factor	1
Large displacement	Off
Compute free body forces	On
Friction	Off
Use Adaptive Method:	Off
Result folder	SOLIDWORKS document (C:\Users\masonbuehler\Downloads\CAD-20251208T223626Z-1-001\CAD\Tilty Loader)

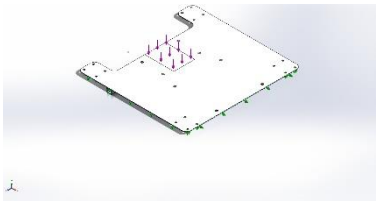
Units

Unit system:	SI (MKS)
Length/Displacement	mm
Temperature	Kelvin
Angular velocity	Rad/sec
Pressure/Stress	N/m^2

Material Properties

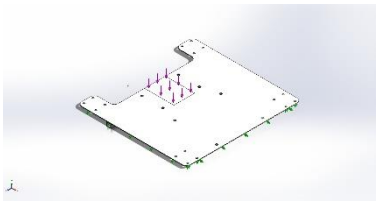
Model Reference	Properties		Components
	**Name:**	AISI 1020	SolidBody 7(Split Line1)(Base Plate)
	Model type:	Linear Elastic Isotropic	
	Default failure criterion:	Unknown	
	Yield strength:	3.51571e+08 N/m^2	
	Tensile strength:	4.20507e+08 N/m^2	
	Elastic modulus:	2e+11 N/m^2	
	Poisson's ratio:	0.29	
	Mass density:	7,900 kg/m^3	
	Shear modulus:	7.7e+10 N/m^2	
	Thermal expansion coefficient:	1.5e-05 /Kelvin	
Curve Data:N/A			

Loads and Fixtures

Fixture name	Fixture Image	Fixture Details
Roller/Slider-1		**Entities:** 2 face(s) **Type:** Roller/Slider

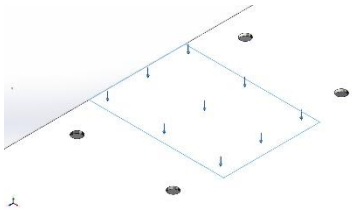
Resultant Forces

Components	X	Y	Z	Resultant
Reaction force(N)	0.00306368	0	0.00117493	0.00328125
Reaction Moment(N.m)	0	0	0	0

Fixture name	Fixture Image	Fixture Details
Roller/Slider-2		**Entities:** 16 face(s) **Type:** Roller/Slider

Resultant Forces

Components	X	Y	Z	Resultant
Reaction force(N)	0	222.391	0	222.391
Reaction Moment(N.m)	0	0	0	0

Load name	Load Image	Load Details
Force-1		**Entities:** 1 face(s) **Type:** Apply normal force **Value:** 222.4 N

Connector Definitions
No Data

Interaction Information
No Data

Mesh information

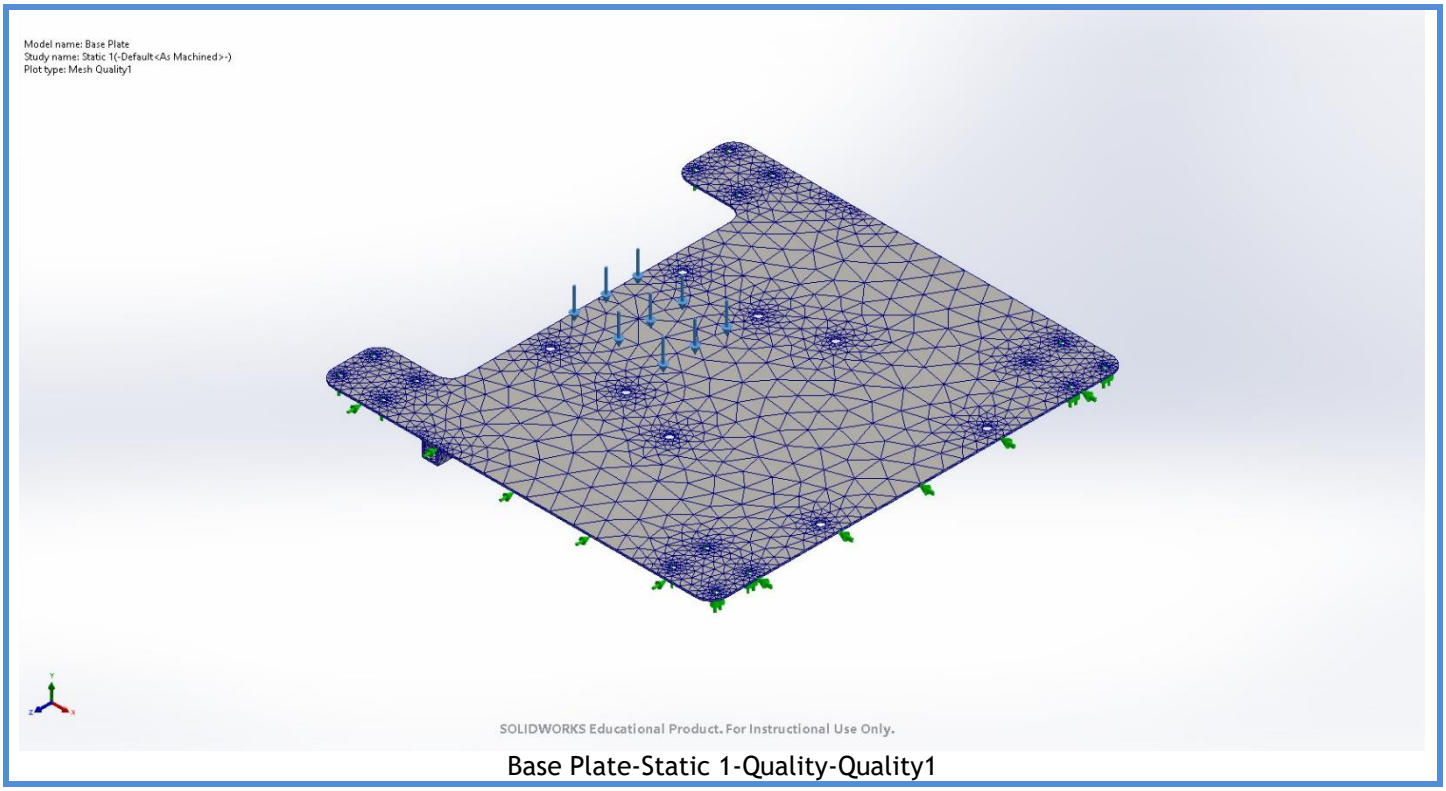
Mesh type	Solid Mesh
Mesher Used:	Blended curvature-based mesh
Jacobian points for High quality mesh	16 Points
Maximum element size	0.792133 in
Minimum element size	0.0765367 in
Mesh Quality	High

Mesh information - Details

Total Nodes	60753
Total Elements	29666
Maximum Aspect Ratio	58.66
% of elements with Aspect Ratio < 3	26
Percentage of elements with Aspect Ratio > 10	16.8
Percentage of distorted elements	0
Time to complete mesh(hh;mm;ss):	00:00:14
Computer name:	ENG401700

Mesh Quality Plots

Name	Type	Min	Max
Quality1	Mesh	-	-



Base Plate-Static 1-Quality-Quality1

Sensor Details

No Data

Resultant Forces

Reaction forces

Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	N	0.00306368	222.391	0.00117493	222.391

Reaction Moments

Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	N.m	0	0	0	0

Free body forces

Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	N	-0.630619	-0.832804	0.221476	1.06785

Free body moments

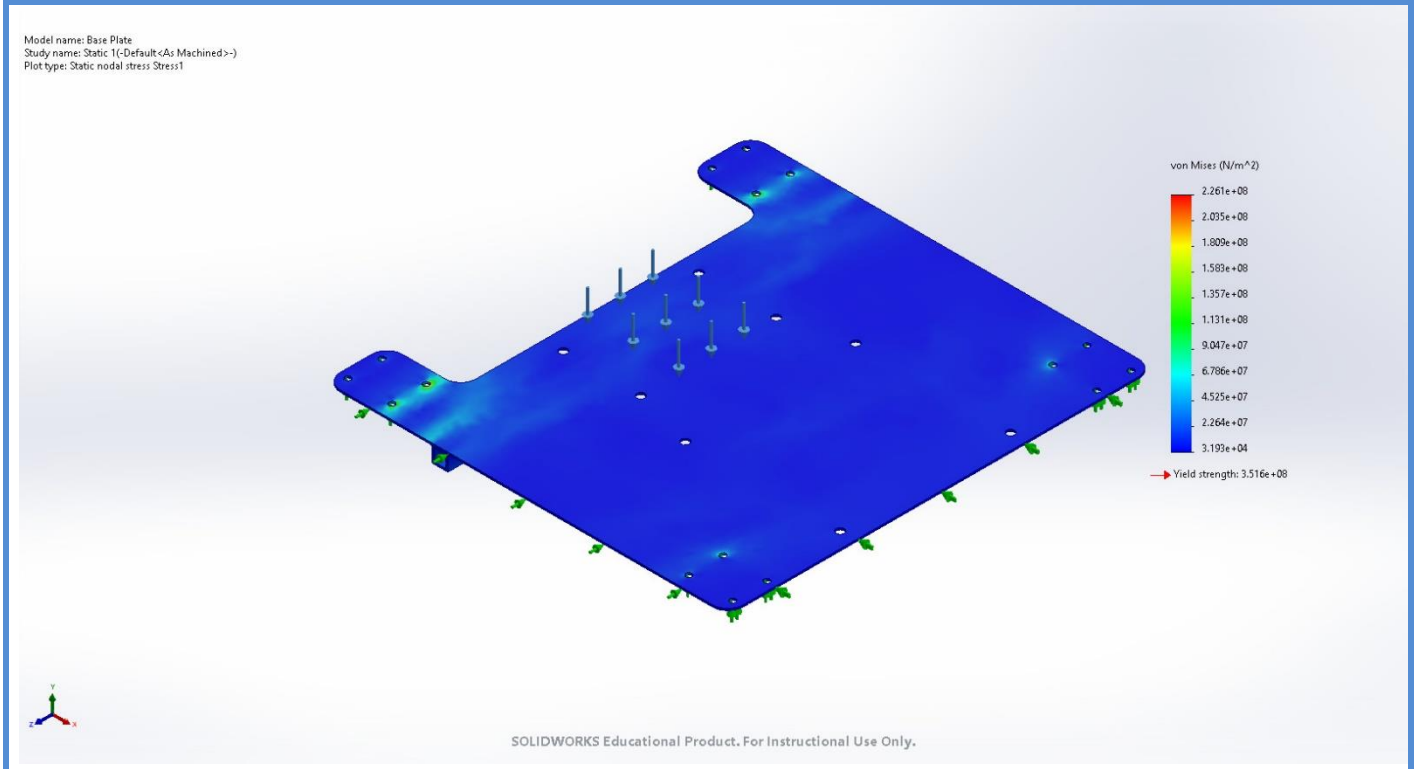
Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	N.m	0	0	0	1e-33

Beams

No Data

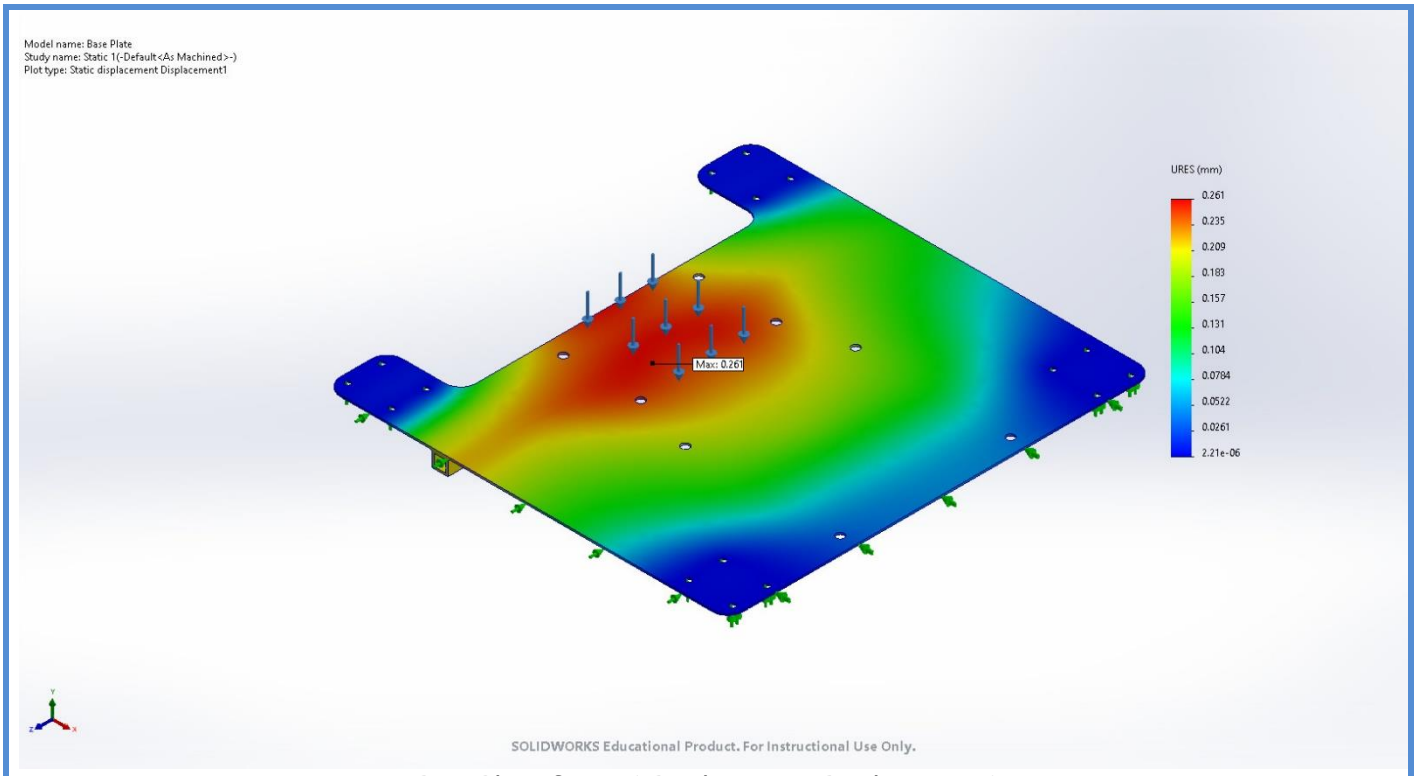
Study Results

Name	Type	Min	Max
Stress1	VON: von Mises Stress	3.193e+04N/m^2 Node: 23667	2.261e+08N/m^2 Node: 55195



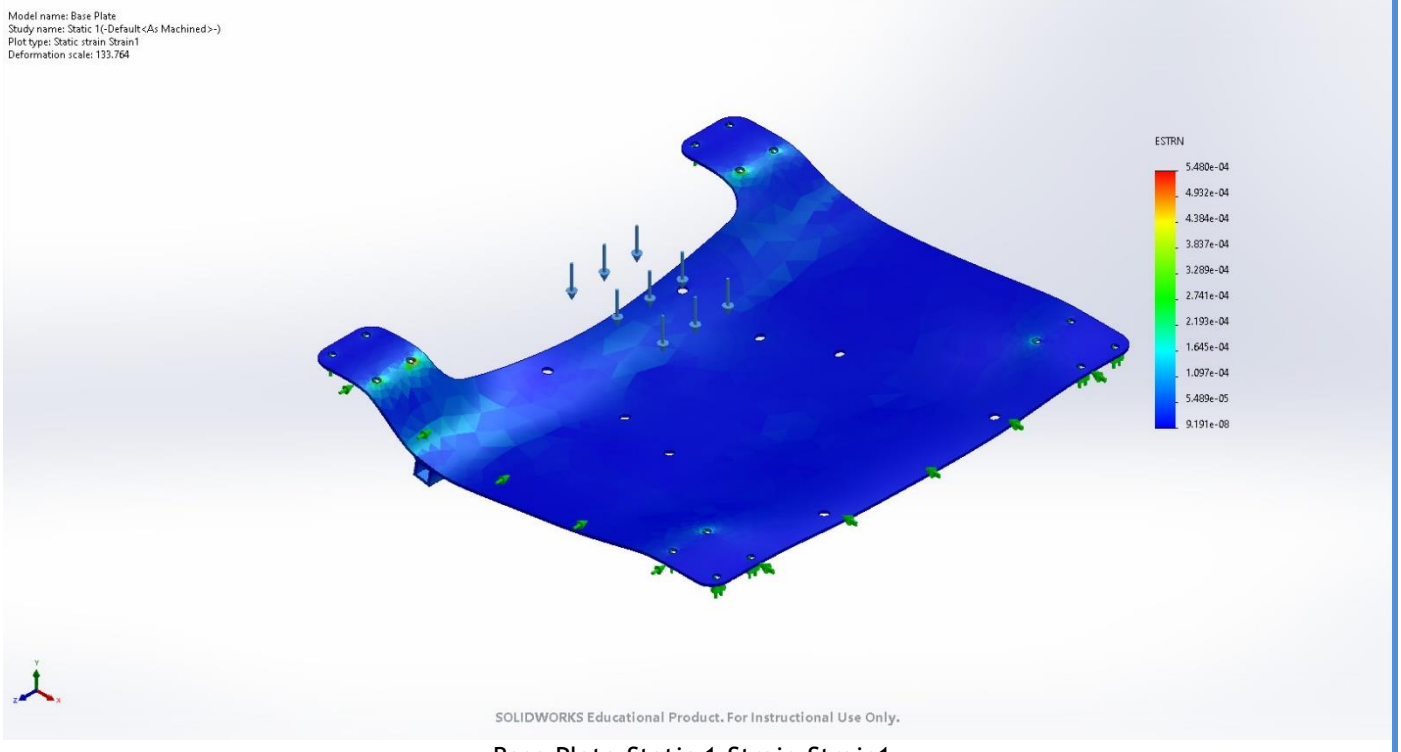
Base Plate-Static 1-Stress-Stress1

Name	Type	Min	Max
Displacement1	URES: Resultant Displacement	2.21e-06mm Node: 20184	0.261mm Node: 47410



Base Plate-Static 1-Displacement-Displacement1

Name	Type	Min	Max
Strain1	ESTRN: Equivalent Strain	9.191e-08 Element: 21780	5.480e-04 Element: 13653



Base Plate-Static 1-Strain-Strain1

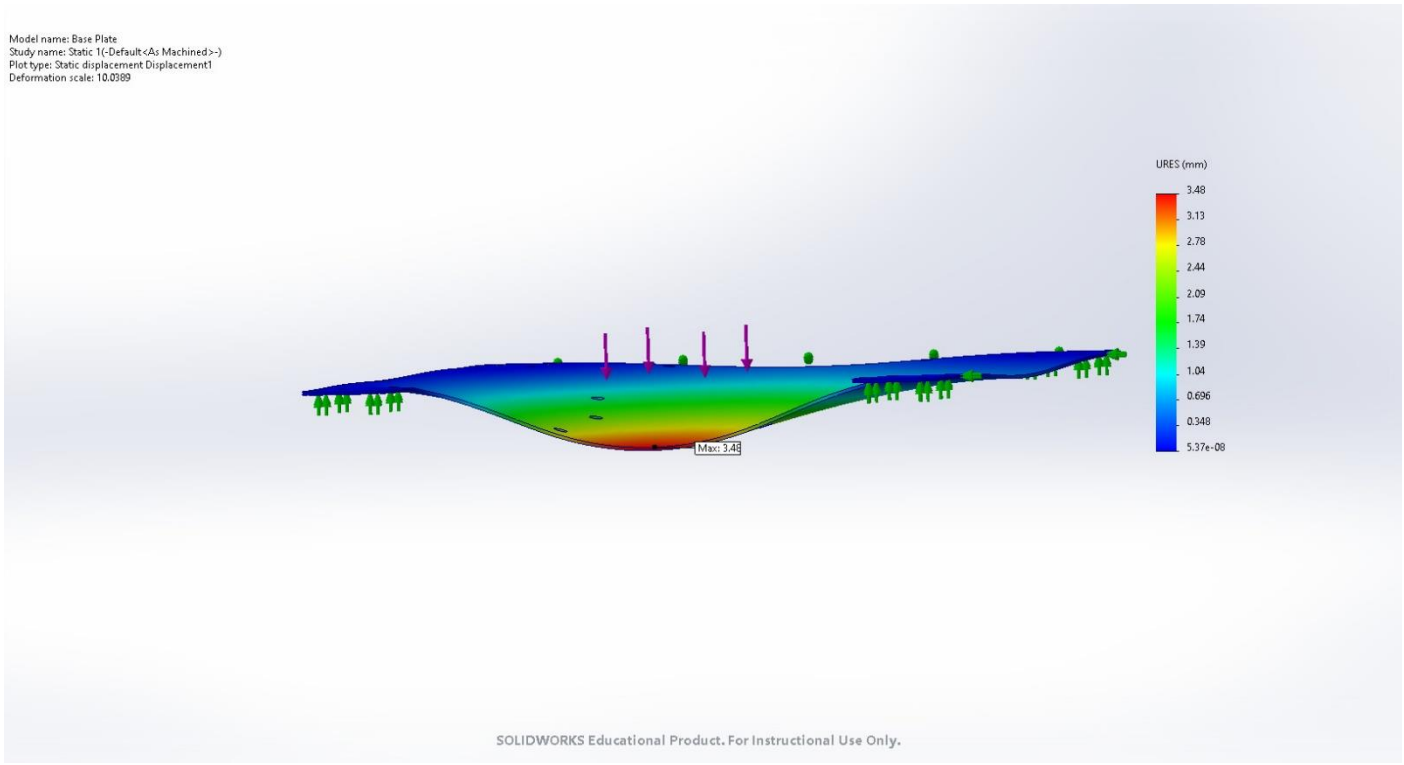


Image-1

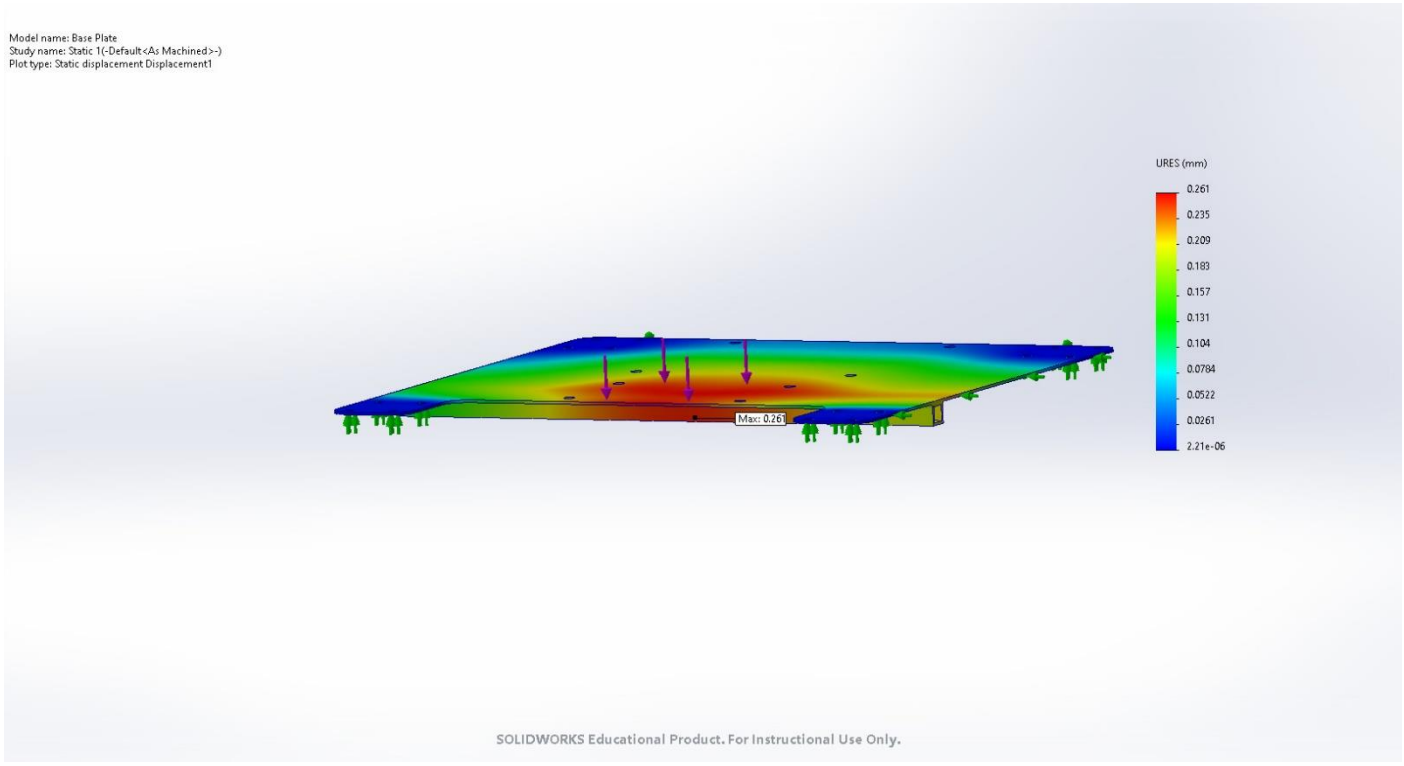
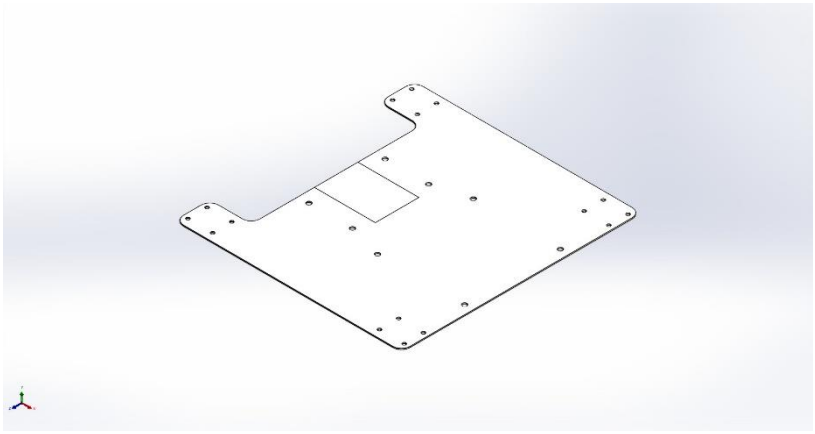


Image-2

Conclusion



Simulation of Base Plate

Date: Monday, December 8, 2025
Designer: Solidworks
Study name: Static 1
Analysis type: Static

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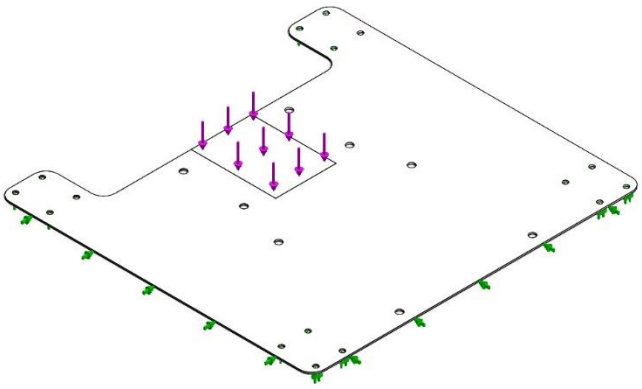
Description

No Data

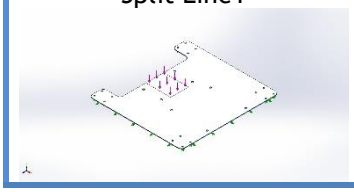
Assumptions

Model Information



Model name: Base Plate
Current Configuration: Default<As Machined>

Solid Bodies

Document Name and Reference	Treated As	Volumetric Properties	Document Path/Date Modified
Split Line1 	Solid Body	**Mass:1.24953 kg** **Volume:0.000158168 m^3** **Density:7,900 kg/m^3** **Weight:12.2454 N**	**C:\Users\masonbuehler\Downloads\CAD-20251208T223626Z-1-001\CAD\Tilty Loader\Base Plate.SLDPRT** Dec 8 17:25:41 2025

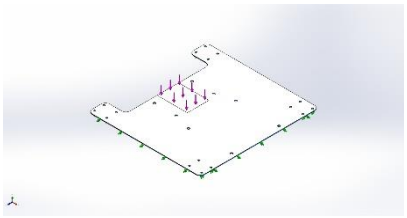
Study Properties

Study name	Static 1
Analysis type	Static
Mesh type	Solid Mesh
Thermal Effect:	On
Thermal option	Include temperature loads
Zero strain temperature	298 Kelvin
Include fluid pressure effects from SOLIDWORKS Flow Simulation	Off
Solver type	Automatic
Inplane Effect:	Off
Soft Spring:	Off
Inertial Relief:	Off
Incompatible bonding options	Automatic
Contact penalty stiffness scale factor	1
Large displacement	Off
Compute free body forces	On
Friction	Off
Use Adaptive Method:	Off
Result folder	SOLIDWORKS document (C:\Users\masonbuehler\Downloads\CAD-20251208T223626Z-1-001\CAD\Tilty Loader)

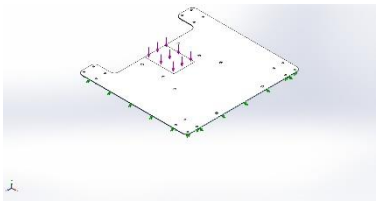
Units

Unit system:	SI (MKS)
Length/Displacement	mm
Temperature	Kelvin
Angular velocity	Rad/sec
Pressure/Stress	N/m^2

Material Properties

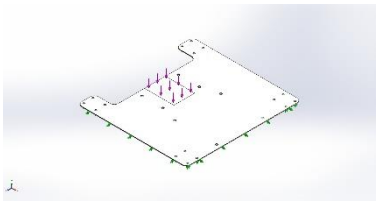
Model Reference	Properties	Components
	**Name:** AISI 1020 **Model type:** Linear Elastic Isotropic **Default failure criterion:** Unknown **Yield strength:** 3.51571e+08 N/m^2 **Tensile strength:** 4.20507e+08 N/m^2 **Elastic modulus:** 2e+11 N/m^2 **Poisson's ratio:** 0.29 **Mass density:** 7,900 kg/m^3 **Shear modulus:** 7.7e+10 N/m^2 **Thermal expansion coefficient:** 1.5e-05 /Kelvin	SolidBody 1(Split Line1)(Base Plate)
Curve Data:N/A		

Loads and Fixtures

Fixture name	Fixture Image	Fixture Details
Roller/Slider-1		**Entities:** 2 face(s) **Type:** Roller/Slider

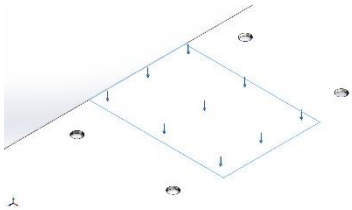
Resultant Forces

Components	X	Y	Z	Resultant
Reaction force(N)	-6.10352e-05	0	6.8903e-05	9.20484e-05
Reaction Moment(N.m)	0	0	0	0

Fixture name	Fixture Image	Fixture Details
Roller/Slider-2		**Entities:** 16 face(s) **Type:** Roller/Slider

Resultant Forces

Components	X	Y	Z	Resultant
Reaction force(N)	0	222.4	0	222.4
Reaction Moment(N.m)	0	0	0	0

Load name	Load Image	Load Details
Force-1		**Entities:** 1 face(s) **Type:** Apply normal force **Value:** 222.4 N

Connector Definitions

No Data

Interaction Information

No Data

Mesh information

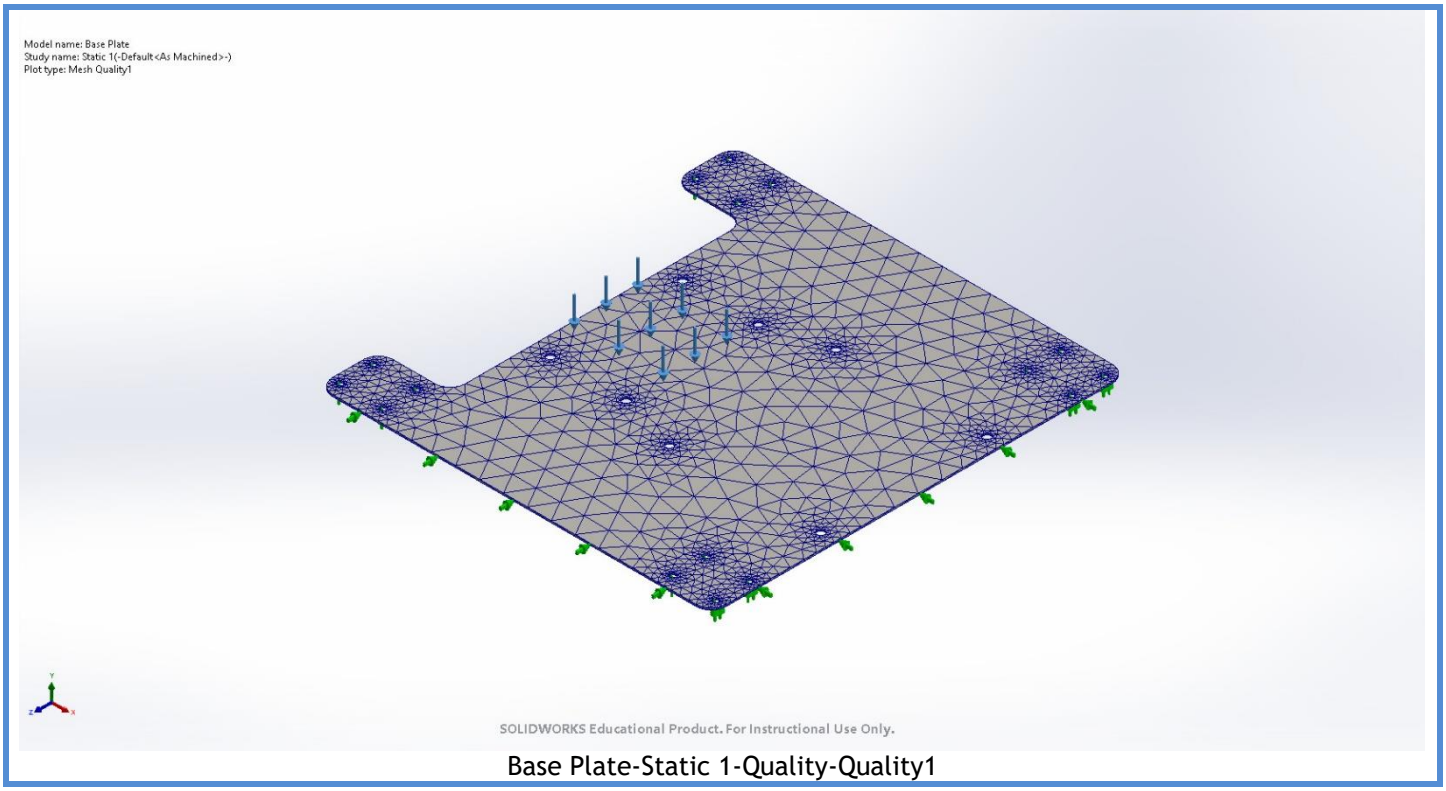
Mesh type	Solid Mesh
Mesher Used:	Blended curvature-based mesh
Jacobian points for High quality mesh	16 Points
Maximum element size	0.792133 in
Minimum element size	0.0765367 in
Mesh Quality	High

Mesh information - Details

Total Nodes	17891
Total Elements	8473
Maximum Aspect Ratio	14.271
% of elements with Aspect Ratio < 3	39.1
Percentage of elements with Aspect Ratio > 10	7.1
Percentage of distorted elements	0
Time to complete mesh(hh;mm;ss):	00:00:07
Computer name:	ENG401700

Mesh Quality Plots

Name	Type	Min	Max
Quality1	Mesh	-	-



Base Plate-Static 1-Quality-Quality1

Sensor Details

No Data

Resultant Forces

Reaction forces

Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	N	-6.10352e-05	222.4	6.8903e-05	222.4

Reaction Moments

Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	N.m	0	0	0	0

Free body forces

Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	N	-9.15527e-05	0.000333428	0.000106454	0.000361785

Free body moments

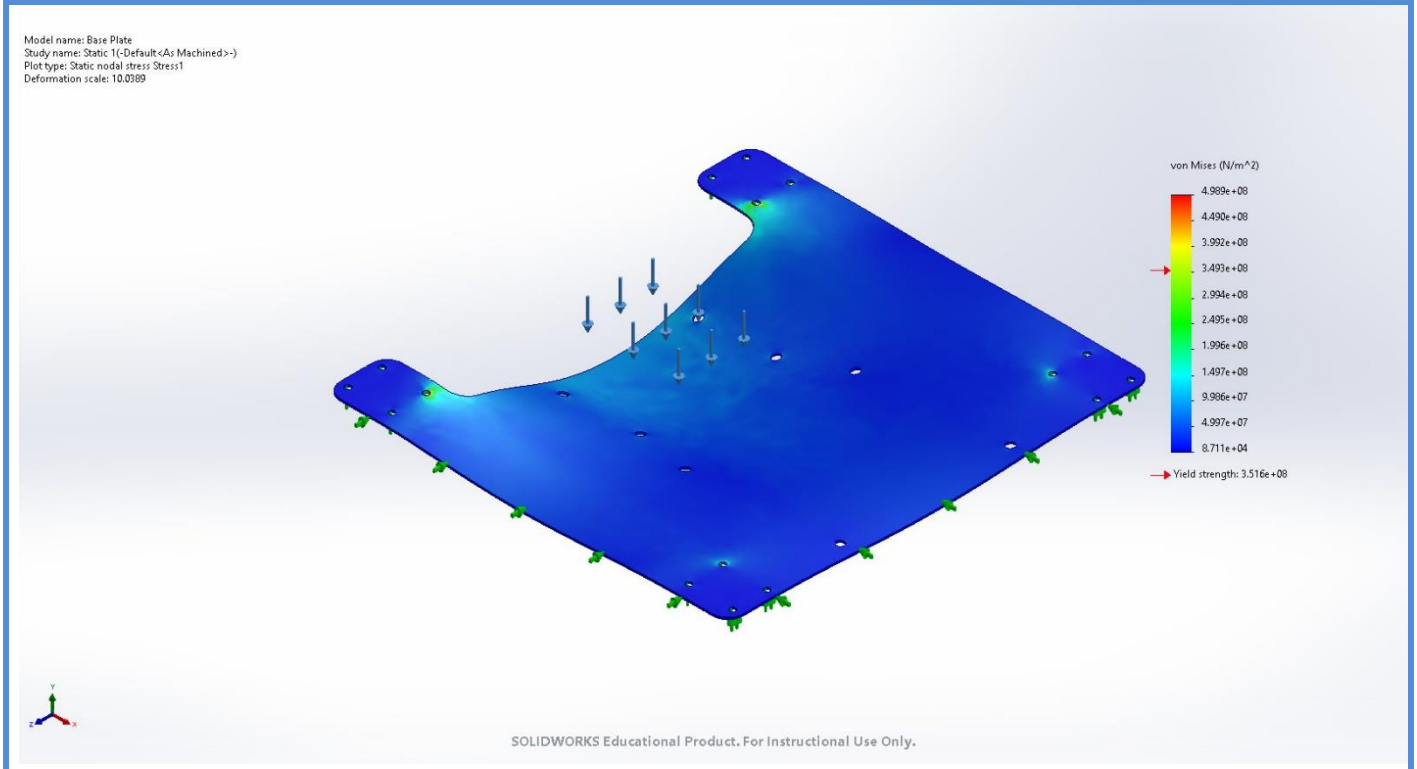
Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	N.m	0	0	0	1e-33

Beams

No Data

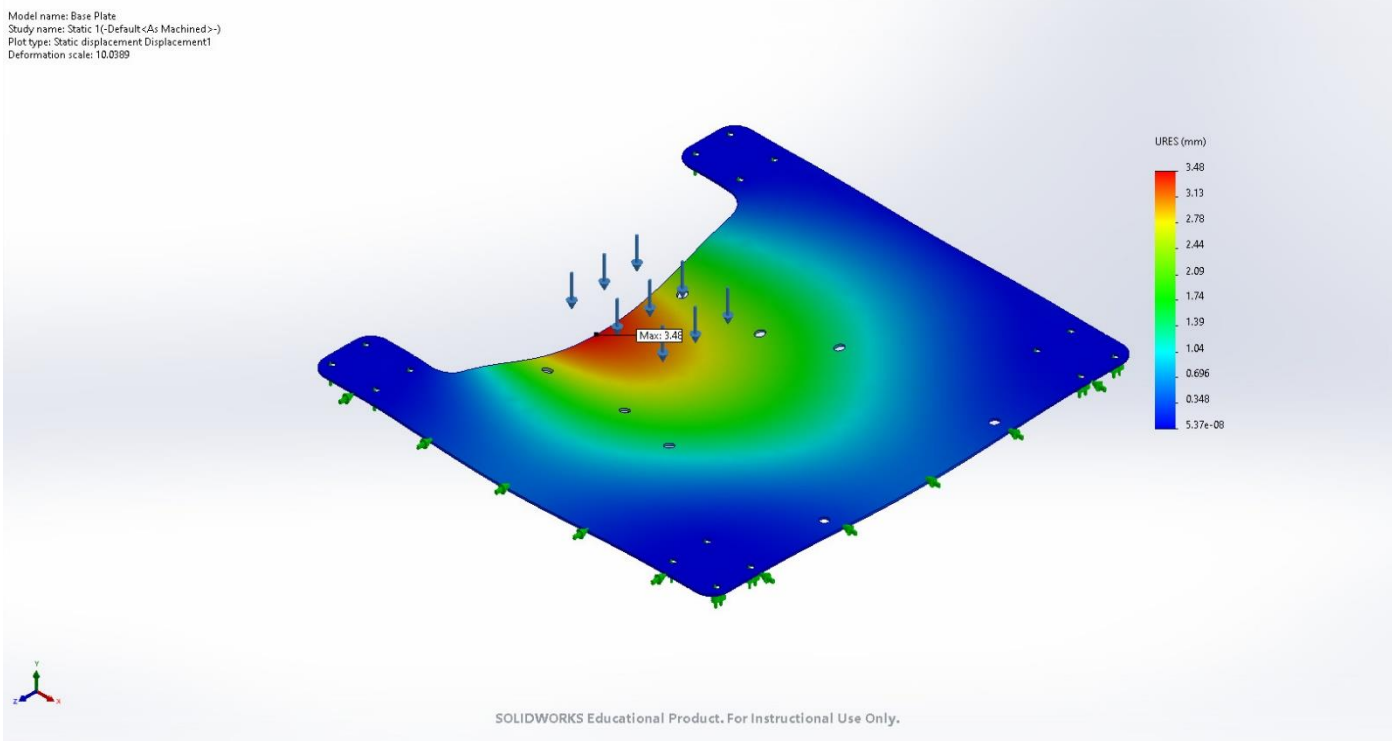
Study Results

Name	Type	Min	Max
Stress1	VON: von Mises Stress	8.711e+04N/m^2 Node: 5313	4.989e+08N/m^2 Node: 14565



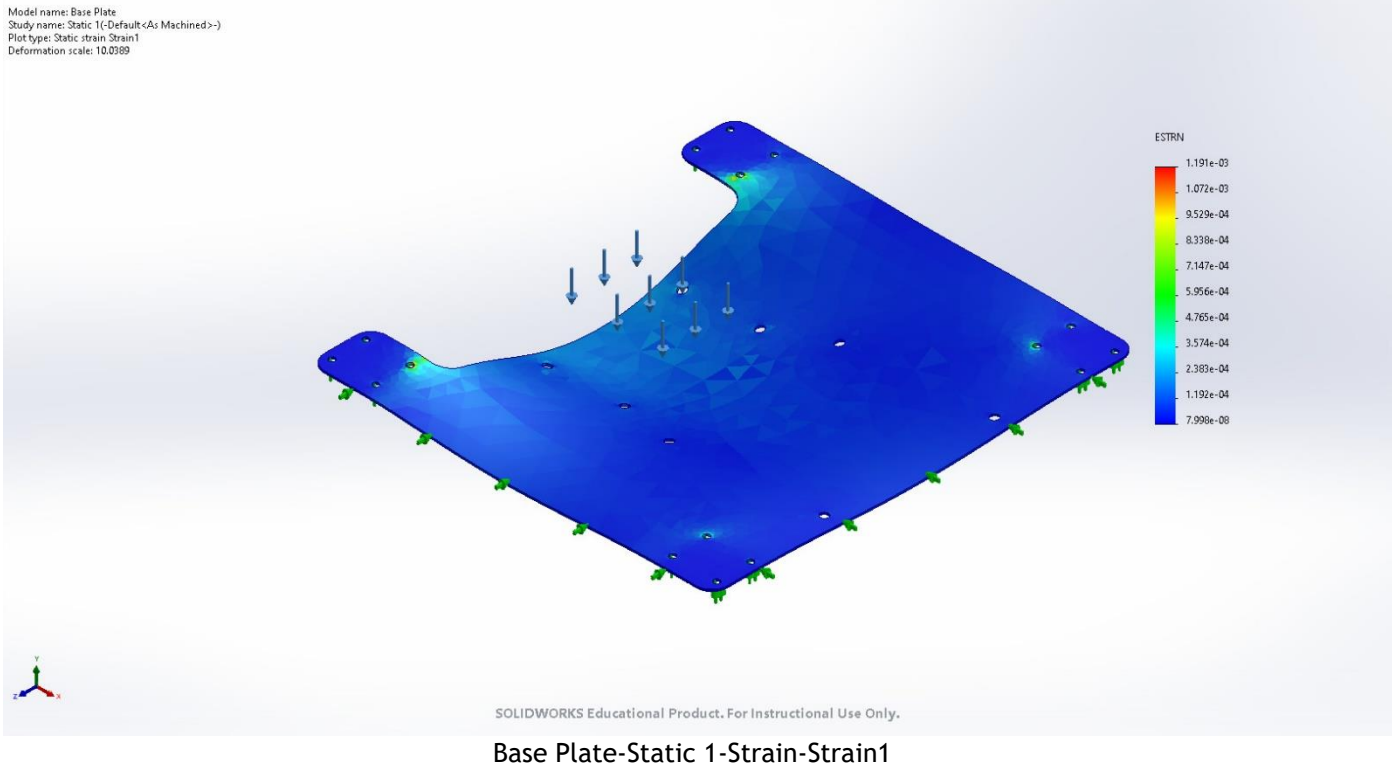
Base Plate-Static 1-Stress-Stress1

Name	Type	Min	Max
Displacement1	URES: Resultant Displacement	5.37e-08mm Node: 3894	3.48mm Node: 134



Base Plate-Static 1-Displacement-Displacement1

Name	Type	Min	Max
Strain1	ESTRN: Equivalent Strain	7.998e-08 Element: 4788	1.191e-03 Element: 562



Base Plate-Static 1-Strain-Strain1

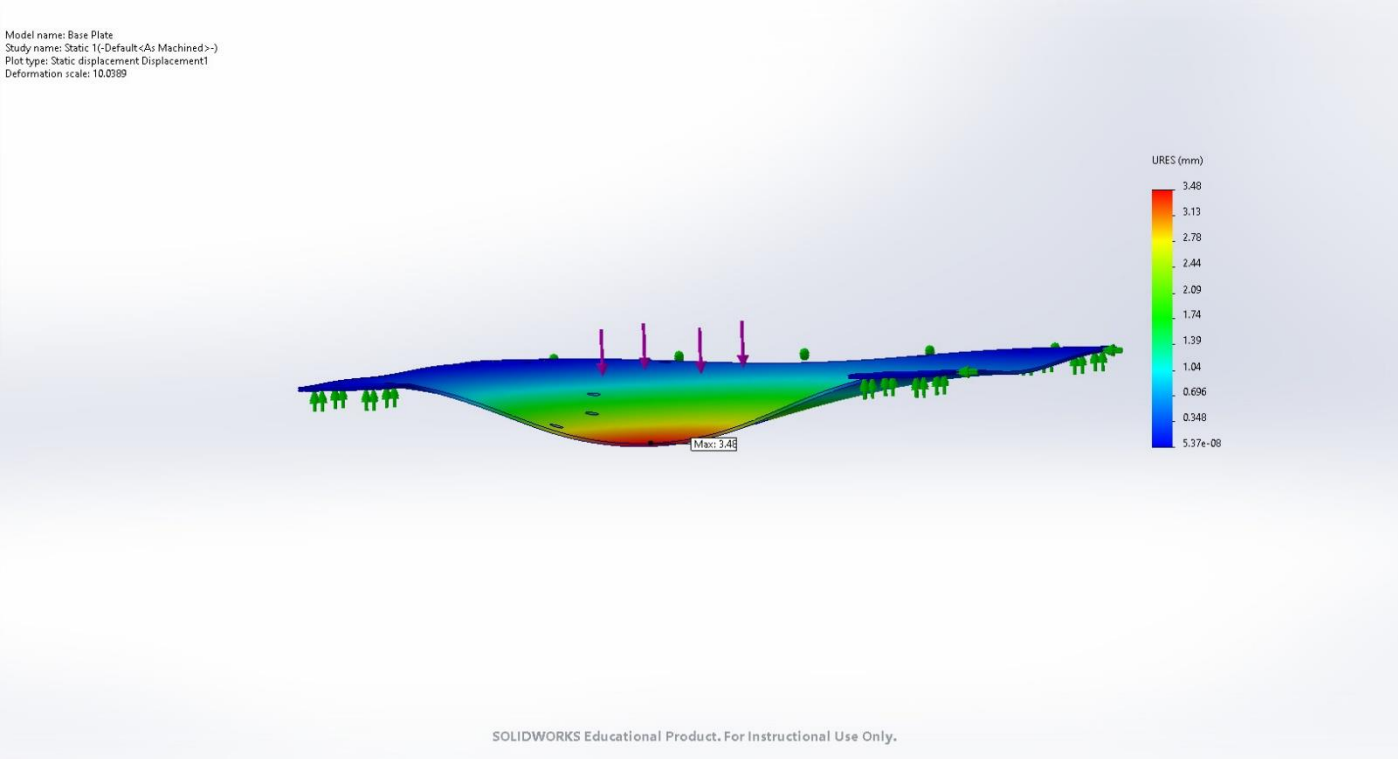


Image-1

Conclusion