

Simulation of BASIC FRAME

Date

Designer: Solidworks

Study name: Position 11

Analysis type: Static

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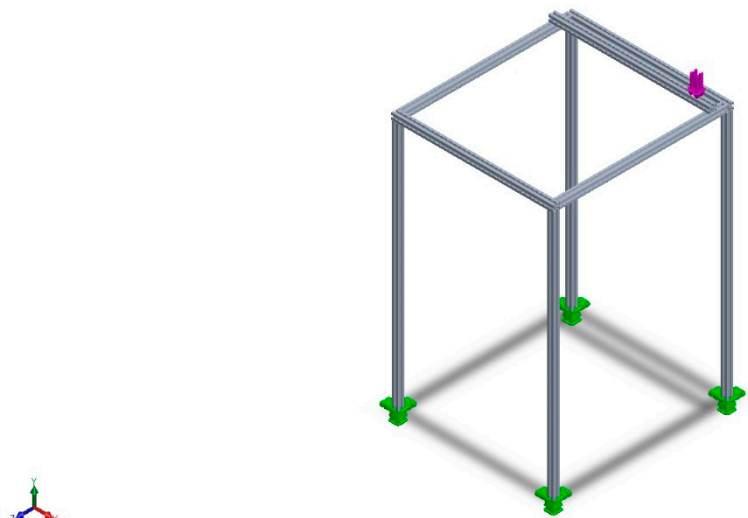
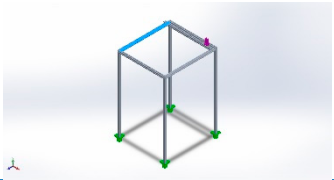
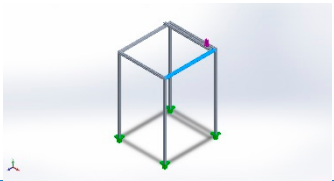
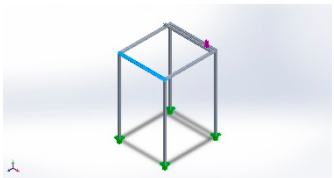
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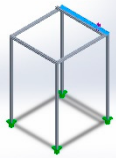
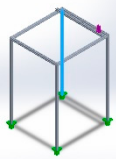
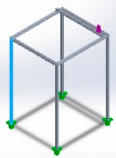
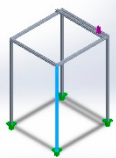
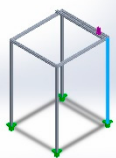
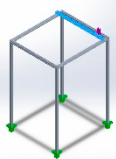
Assumptions

- Gripper is removed and force equals to its weight is applied instead to simplify the analysis.
- Weight of stepper motors, racks, and other assembly part is moved to the corner (severe position).

Model Information

 <p>Model name: BASIC FRAME Current Configuration: Default</p>			
Solid Bodies			
Document Name and Reference	Treated As	Volumetric Properties	Document Path/Date Modified
Boss-Extrude1 	Solid Body	Mass:1.32741 kg Volume:0.000491632 m ³ Density:2700 kg/m ³ Weight:13.0086 N	C:\Users\Zeina\OneDrive\Desktop\Maryam\Fram\Frame\C1_GA4040_1000.sldprt Mar 10 22:10:53 2023
Boss-Extrude1 	Solid Body	Mass:1.32741 kg Volume:0.000491632 m ³ Density:2700 kg/m ³ Weight:13.0086 N	C:\Users\Zeina\OneDrive\Desktop\Maryam\Fram\Frame\C1_GA4040_1000.sldprt Mar 10 22:10:53 2023
Boss-Extrude1 	Solid Body	Mass:1.28758 kg Volume:0.000476883 m ³ Density:2700 kg/m ³ Weight:12.6183 N	C:\Users\Zeina\OneDrive\Desktop\Maryam\Fram\Frame\GA4040_TSection_1500.sldprt Mar 10 22:11:44 2023



Boss-Extrude1 	Solid Body	Mass:1.28758 kg Volume:0.000476883 m³ Density:2700 kg/m³ Weight:12.6183 N	C:\Users\Zeina\OneDrive\Desktop\Maryam\Fram\Frame\GA4040_TSection_1500.sldprt Mar 10 22:11:44 2023
Fillet3 	Solid Body	Mass:1.99063 kg Volume:0.000737269 m³ Density:2700 kg/m³ Weight:19.5081 N	C:\Users\Zeina\OneDrive\Desktop\Maryam\Fram\Frame\GA4040_TSection_1500_1.sldprt Mar 10 22:13:19 2023
Fillet3 	Solid Body	Mass:1.99063 kg Volume:0.000737269 m³ Density:2700 kg/m³ Weight:19.5081 N	C:\Users\Zeina\OneDrive\Desktop\Maryam\Fram\Frame\GA4040_TSection_1500_1.sldprt Mar 10 22:13:19 2023
Fillet3 	Solid Body	Mass:1.99063 kg Volume:0.000737269 m³ Density:2700 kg/m³ Weight:19.5081 N	C:\Users\Zeina\OneDrive\Desktop\Maryam\Fram\Frame\GA4040_TSection_1500_1.sldprt Mar 10 22:13:19 2023
Fillet3 	Solid Body	Mass:1.99063 kg Volume:0.000737269 m³ Density:2700 kg/m³ Weight:19.5081 N	C:\Users\Zeina\OneDrive\Desktop\Maryam\Fram\Frame\GA4040_TSection_1500_1.sldprt Mar 10 22:13:19 2023
Split Line5 	Solid Body	Mass:1.2836 kg Volume:0.000475408 m³ Density:2700 kg/m³ Weight:12.5793 N	C:\Users\Zeina\OneDrive\Desktop\Maryam\Fram\Frame\Loaded bar (Left&Right).SLDPRT Mar 10 21:55:26 2023



Study Properties

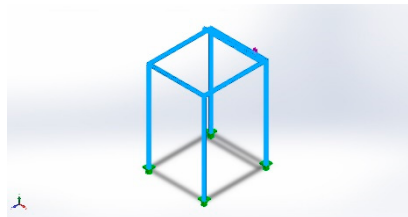
Study name	Position 11
Analysis type	Static
Mesh type	Solid Mesh
Thermal Effect:	On
Thermal option	Include temperature loads
Zero strain temperature	298 Kelvin
Include fluid pressure effects from SOLIDWORKS Flow Simulation	Off
Solver type	FFEPlus
Inplane Effect:	Off
Soft Spring:	Off
Inertial Relief:	Off
Incompatible bonding options	Automatic
Large displacement	Off
Compute free body forces	On
Friction	Off
Use Adaptive Method:	Off
Result folder	SOLIDWORKS document (C:\Users\Zeina\OneDrive\Desktop\Maryam\Fram\Fram)

Units

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

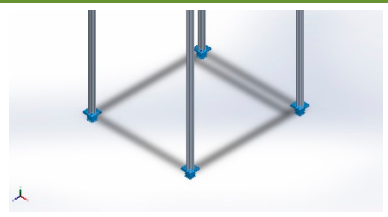


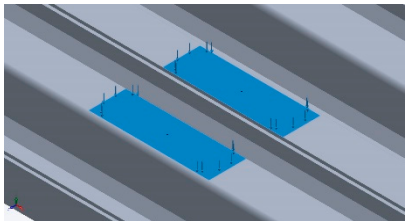
Material Properties

Model Reference	Properties	Components
	Name: 6061 Alloy Model type: Linear Elastic Isotropic Default failure criterion: Max von Mises Stress Yield strength: 5.51485e+07 N/m ² Tensile strength: 1.24084e+08 N/m ² Elastic modulus: 6.9e+10 N/m ² Poisson's ratio: 0.33 Mass density: 2700 kg/m ³ Shear modulus: 2.6e+10 N/m ² Thermal expansion coefficient: 2.4e-05 /Kelvin	SolidBody 1(Boss-Extrude1)(C1_GA4040_1000-1), SolidBody 1(Boss-Extrude1)(C1_GA4040_1000-2), SolidBody 1(Boss-Extrude1)(GA4040_TSection_1500-1), SolidBody 1(Boss-Extrude1)(GA4040_TSection_1500-2), SolidBody 1(Fillet3)(GA4040_TSection_1500_1-1), SolidBody 1(Fillet3)(GA4040_TSection_1500_1-2), SolidBody 1(Fillet3)(GA4040_TSection_1500_1-3), SolidBody 1(Fillet3)(GA4040_TSection_1500_1-4), SolidBody 1(Split Line5)(Loaded bar (Left&Right)-2)
Curve Data:N/A		

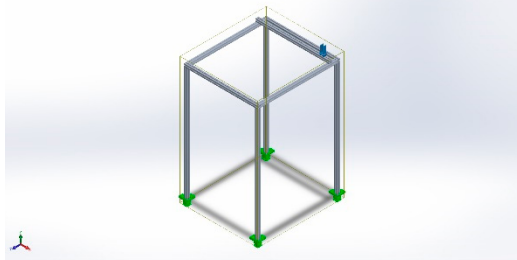


Loads and Fixtures

Fixture name	Fixture Image	Fixture Details		
Fixed-2		Entities: 4 face(s) Type: Fixed Geometry		
Resultant Forces				
Components	X	Y	Z	Resultant
Reaction force(N)	-0.0134554	117.19	0.00853139	117.19
Reaction Moment(N.m)	0	0	0	0

Load name	Load Image	Load Details
Force-1		Entities: 2 face(s) Type: Apply normal force Value: 117.2 N

Contact Information

Contact	Contact Image	Contact Properties
Global Contact		Type: Bonded Components: 1 component(s) Options: Compatible mesh



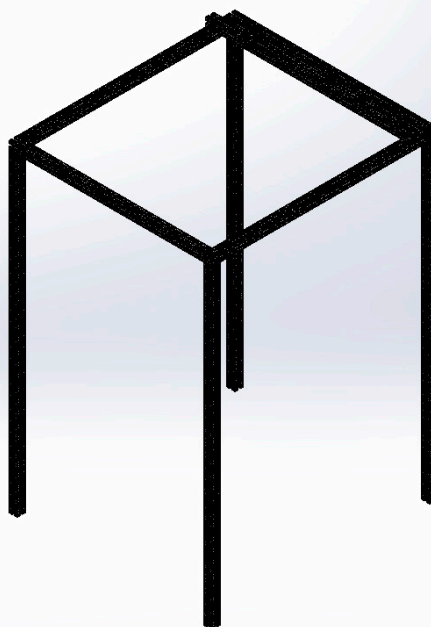
Mesh information

Mesh type	Solid Mesh
Mesher Used:	Curvature-based mesh
Jacobian points	4 Points
Maximum element size	56.8252 mm
Minimum element size	11.365 mm
Mesh Quality Plot	High
Remesh failed parts with incompatible mesh	Off

Mesh information - Details

Total Nodes	1306647
Total Elements	727423
Maximum Aspect Ratio	286.64
% of elements with Aspect Ratio < 3	2.34
% of elements with Aspect Ratio > 10	54
% of distorted elements(Jacobian)	0
Time to complete mesh(hh:mm:ss):	00:01:46
Computer name:	

Model name: BASIC FRAME
Study name: Position 11(-Default-)
Mesh type: Solid Mesh



Resultant Forces

Reaction forces

Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	N	-0.0134554	117.19	0.00853139	117.19

Reaction Moments

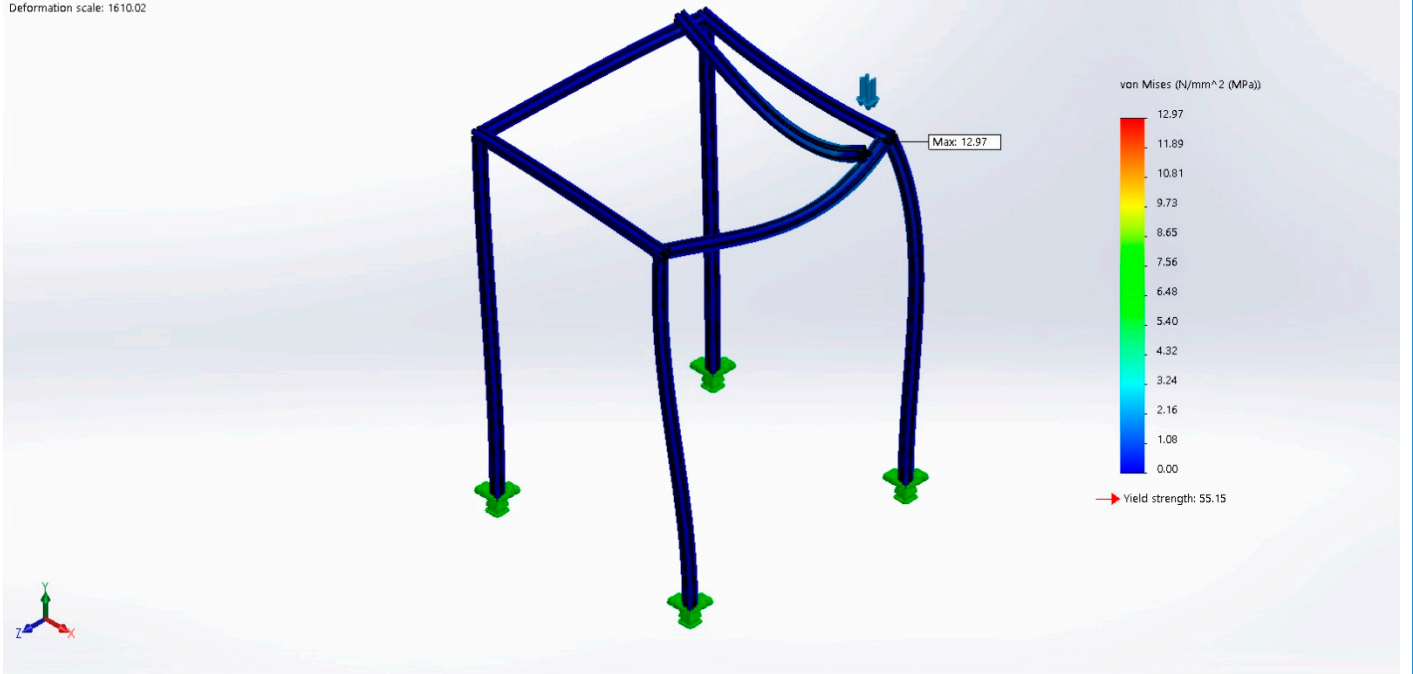
Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	N.m	0	0	0	0



Study Results

Name	Type	Min	Max
Stress1	VON: von Mises Stress	0.00 N/mm ² (MPa) Node: 644374	12.97 N/mm ² (MPa) Node: 319533

Model name: BASIC FRAME
Study name: Position 11(-Default-)
Plot type: Static nodal stress Stress1
Deformation scale: 1610.02

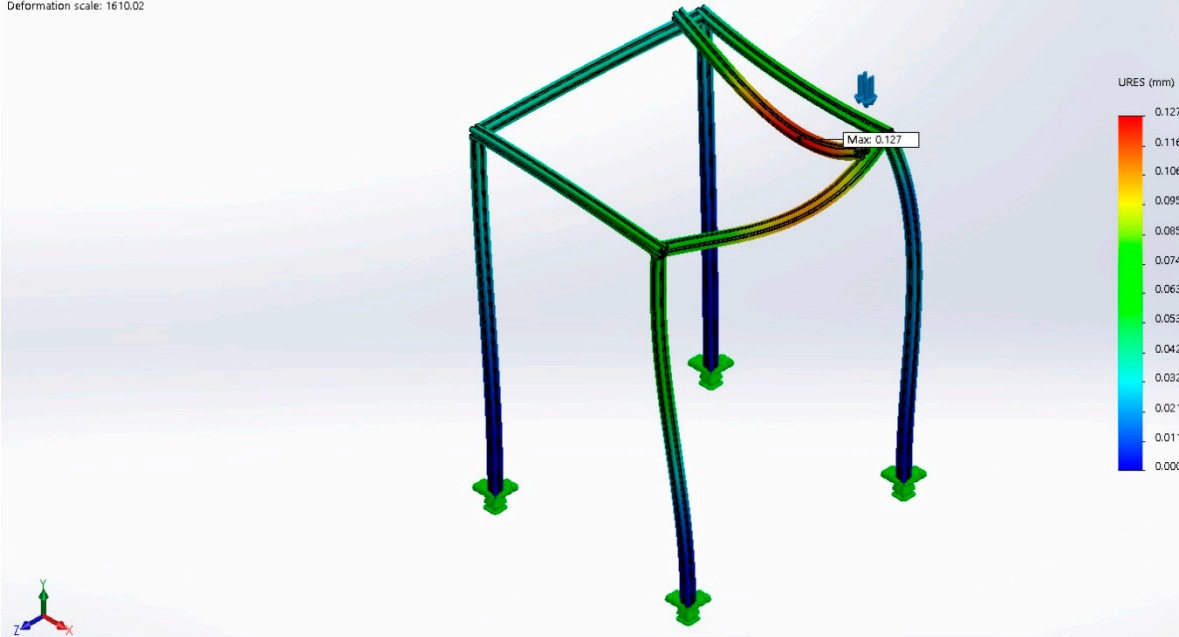


BASIC FRAME-Position 11-Stress-Stress1

Name	Type	Min	Max
Displacement1	URES: Resultant Displacement	0.000 mm Node: 404413	0.127 mm Node: 1238866



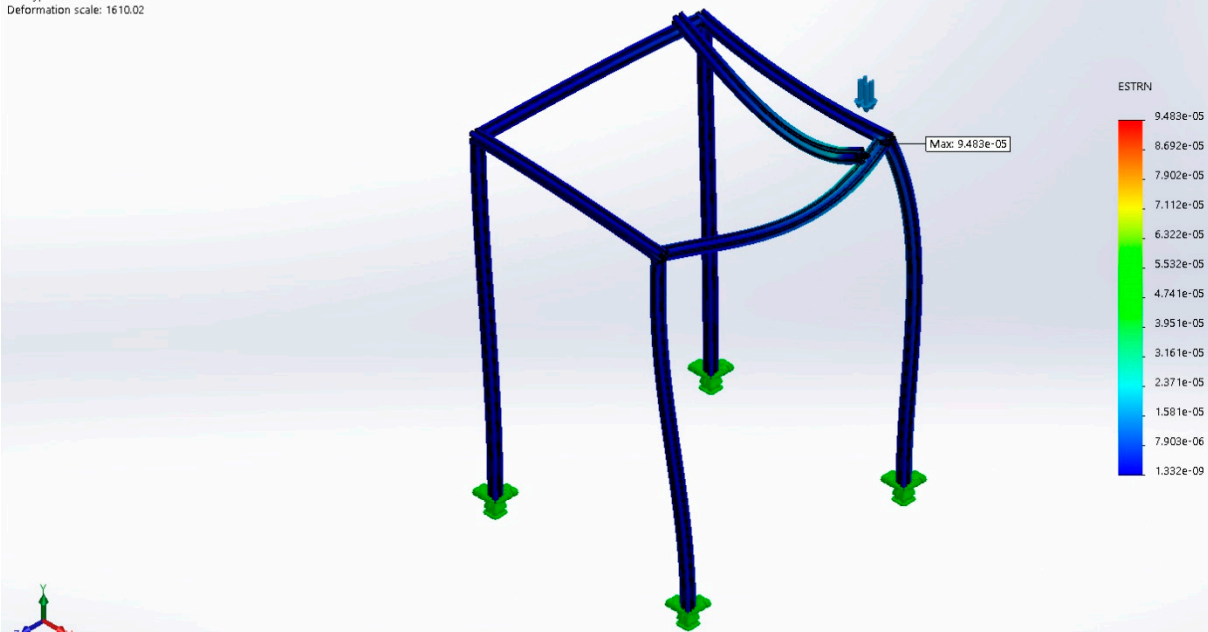
Model name: BASIC FRAME
 Study name: Position 11(-Default-)
 Plot type: Static displacement Displacement1
 Deformation scale: 1610.02



BASIC FRAME-Position 11-Displacement-Displacement1

Name	Type	Min	Max
Strain1	ESTRN: Equivalent Strain	1.332e-09 Element: 376861	9.483e-05 Element: 174269

Model name: BASIC FRAME
 Study name: Position 11(-Default-)
 Plot type: Static strain Strain1
 Deformation scale: 1610.02

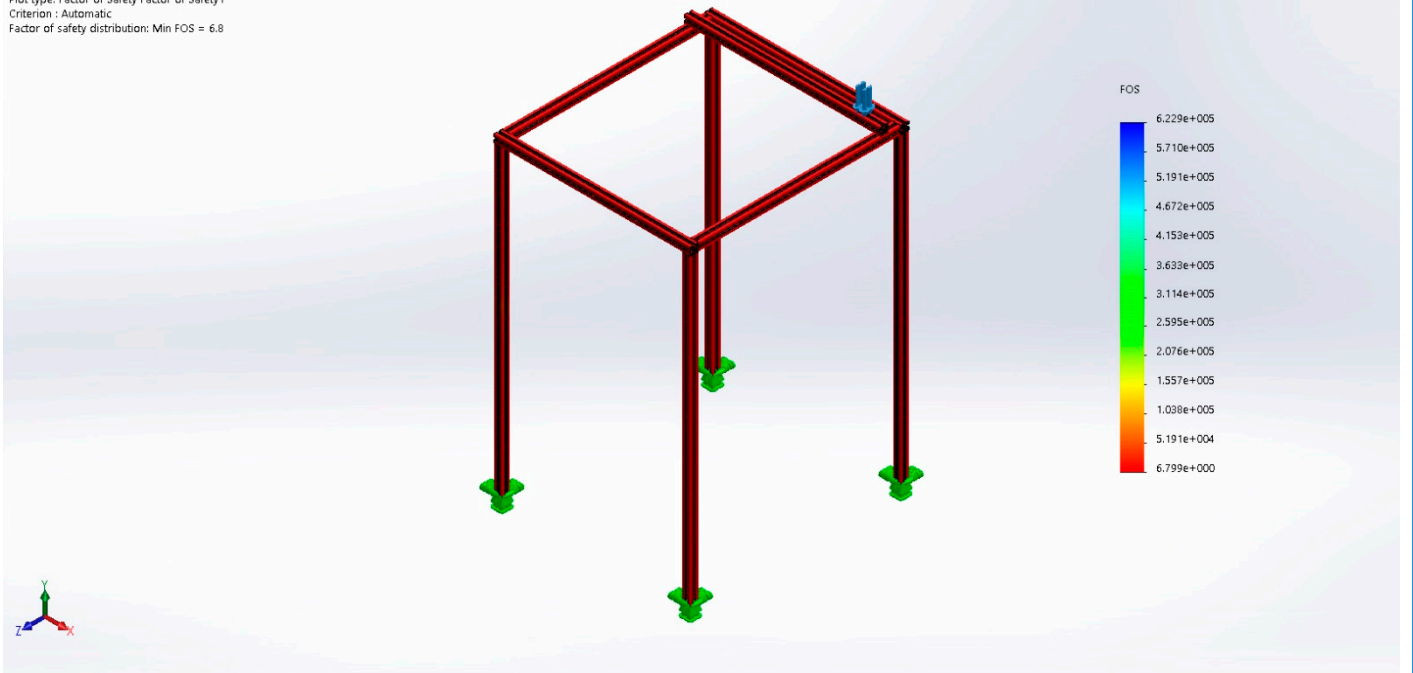


BASIC FRAME-Position 11-Strain-Strain1

Name	Type	Min	Max
Factor of Safety1	Automatic	6.79933 Node: 319533	622879 Node: 644374



Model name: BASIC FRAME
Study name: Position 11(-Default-)
Plot type: Factor of Safety Factor of Safety1
Criterion : Automatic
Factor of safety distribution: Min FOS = 6.8



BASIC FRAME-Position 11-Factor of Safety-Factor of Safety1

