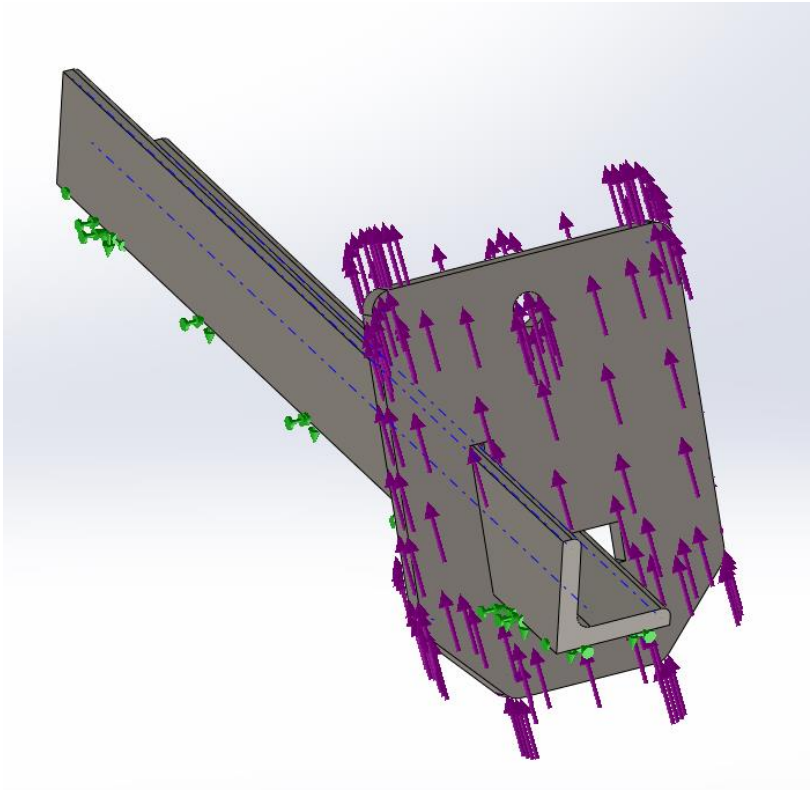


Simulation of MAIN FRAME HOIST BRACKETS-2

Date: Monday, April 15, 2013
Designer: John Bartoli
Study name: Main Frame Hoist Bracket-1
Analysis type: Static

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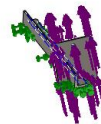
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Description

MAIN FRAME HOIST BRACKETS-2 (95-1108) is used at Triple C as a lifting device for truck beds. One 5/16” chain is attached to this bracket and carries approximately 136-lbs. To overestimate the applied force, one 150-lb force shall act in the direction specified (51 degrees inclined from the horizontal) in the Solidworks model provided.

Model Information



Model name: R&D MAIN HOIST EXAMPLE-2
Current Configuration: Default

Solid Bodies

Document Name and Reference	Treated As	Volumetric Properties	Document Path/Date Modified
Cut-Extrude1 	Solid Body	Mass:1.24918 lb Volume:4.40474 in ³ Density:0.283599 lb/in ³ Weight:1.24833 lbf	G:\Triple C Analyses\Main Hoist Example1\R&D MF ANGLE BRKT_1.sldprt Apr 01 11:50:24 2013
Imported1 	Solid Body	Mass:2.24514 lb Volume:7.9166 in ³ Density:0.283599 lb/in ³ Weight:2.24362 lbf	G:\Triple C Analyses\Main Hoist Example1\AI 1.5 x 1.5 x .25 L 11.5_Default_As Machined__1.sldprt Apr 01 11:35:26 2013



Study Properties

Study name	Main Frame Hoist Bracket-1
Analysis type	Static
Mesh type	Solid Mesh
Thermal Effect:	On
Thermal option	Include temperature loads
Zero strain temperature	77 Fahrenheit
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\jbartoli\appdata\local\temp)

Units

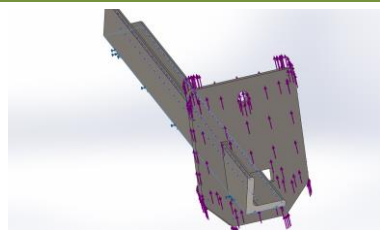
Unit system:	English (IPS)
Length/Displacement	in
Temperature	Fahrenheit
Angular velocity	Hertz
Pressure/Stress	psi

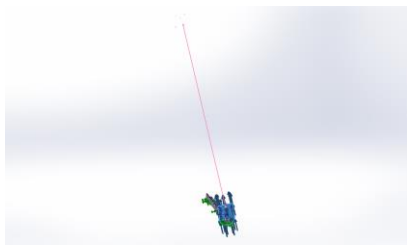


Material Properties

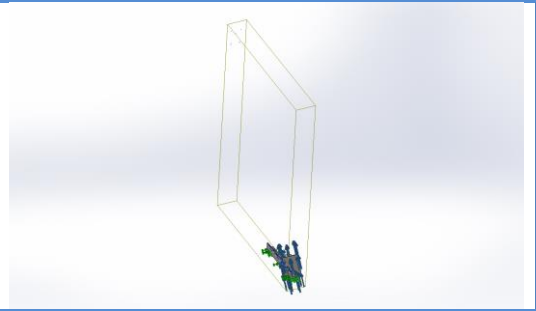
Model Reference	Properties	Components
	Name: ASTM A36 Steel Model type: Linear Elastic Isotropic Default failure criterion: Max von Mises Stress Yield strength: 36259.4 psi Tensile strength: 58015.1 psi Elastic modulus: 2.90075e+007 psi Poisson's ratio: 0.26 Mass density: 0.283599 lb/in ³ Shear modulus: 1.15015e+007 psi	SolidBody 1(Cut-Extrude1)(R&D MF ANGLE BRKT_1-1), SolidBody 1(Imported1)(SUB-FR-555_1-1/SUB-RS-8CI_1-1/Al 1.5 x 1.5 x .25 L 11.5_Default_As Machined__1-2)
Curve Data:N/A		

Loads and Fixtures

Fixture name	Fixture Image	Fixture Details		
Fixed-1		Entities: 1 face(s) Type: Fixed Geometry		
Resultant Forces				
Components	X	Y	Z	Resultant
Reaction force(lbf)	-0.683976	116.729	-94.1984	149.999
Reaction Moment(lbf-in)	0	0	0	0

Load name	Load Image	Load Details
Force-1		Entities: 5 face(s) Type: Apply force Values: ---, ---, -150 lbf

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	0 mm
Minimum element size	0 mm
Mesh Quality	High
Remesh failed parts with incompatible mesh	Off

Mesh Information - Details

Total Nodes	12848
Total Elements	6642
Maximum Aspect Ratio	6.8138
% of elements with Aspect Ratio < 3	99.6
% of elements with Aspect Ratio > 10	0
% of distorted elements(Jacobian)	0
Time to complete mesh(hh:mm:ss):	00:00:03
Computer name:	JBARTOLI1





Resultant Forces

Reaction Forces

Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	lbf	-0.683976	116.729	-94.1984	149.999

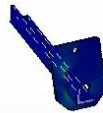
Reaction Moments

Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	lbf-in	0	0	0	0

Study Results

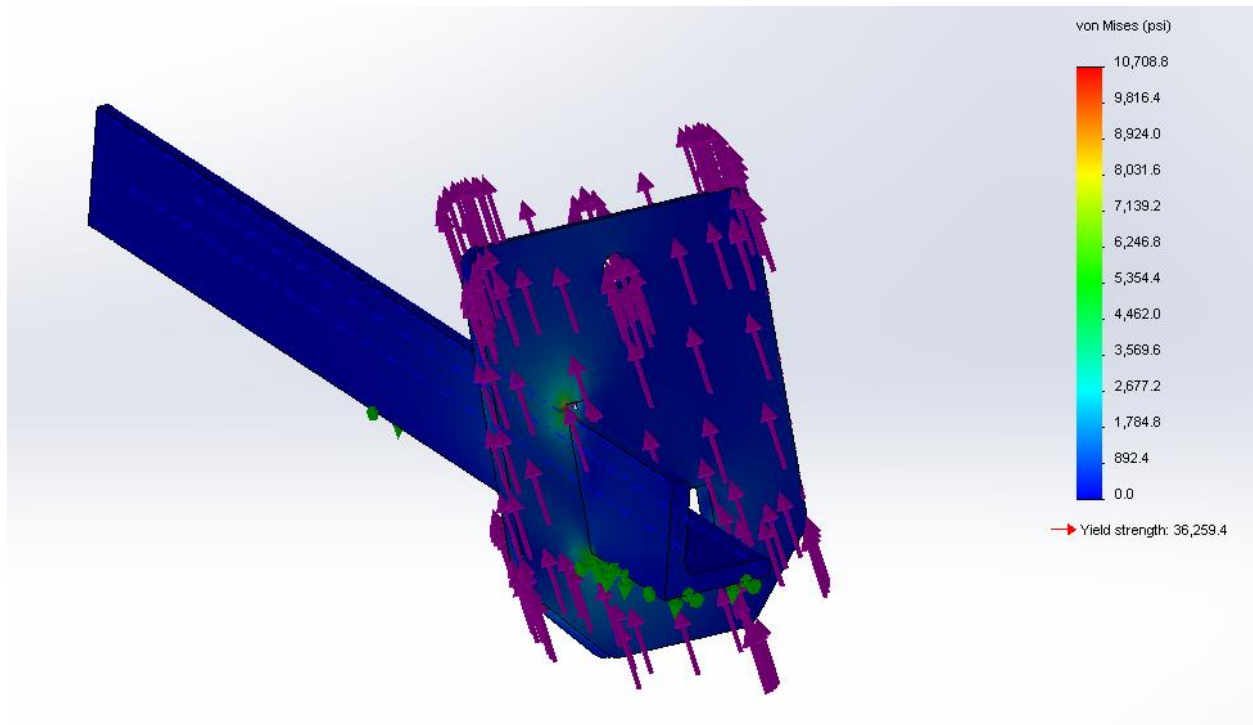
Name	Type	Min	Max
Stress1	VON: von Mises Stress	0.00030404 psi Node: 7822	10708.8 psi Node: 5065

Model name: R&D MAIN HOIST EXAMPLE-2
Study name: Main Frame Hoist Bracket-1
Plot type: Static nodal stress Stress1



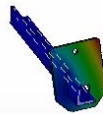
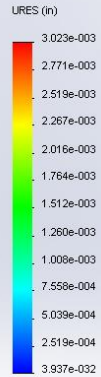
MAIN FRAME HOIST BRACKETS-2 (95-1108)

See next page for zoomed-in view of stress plot.



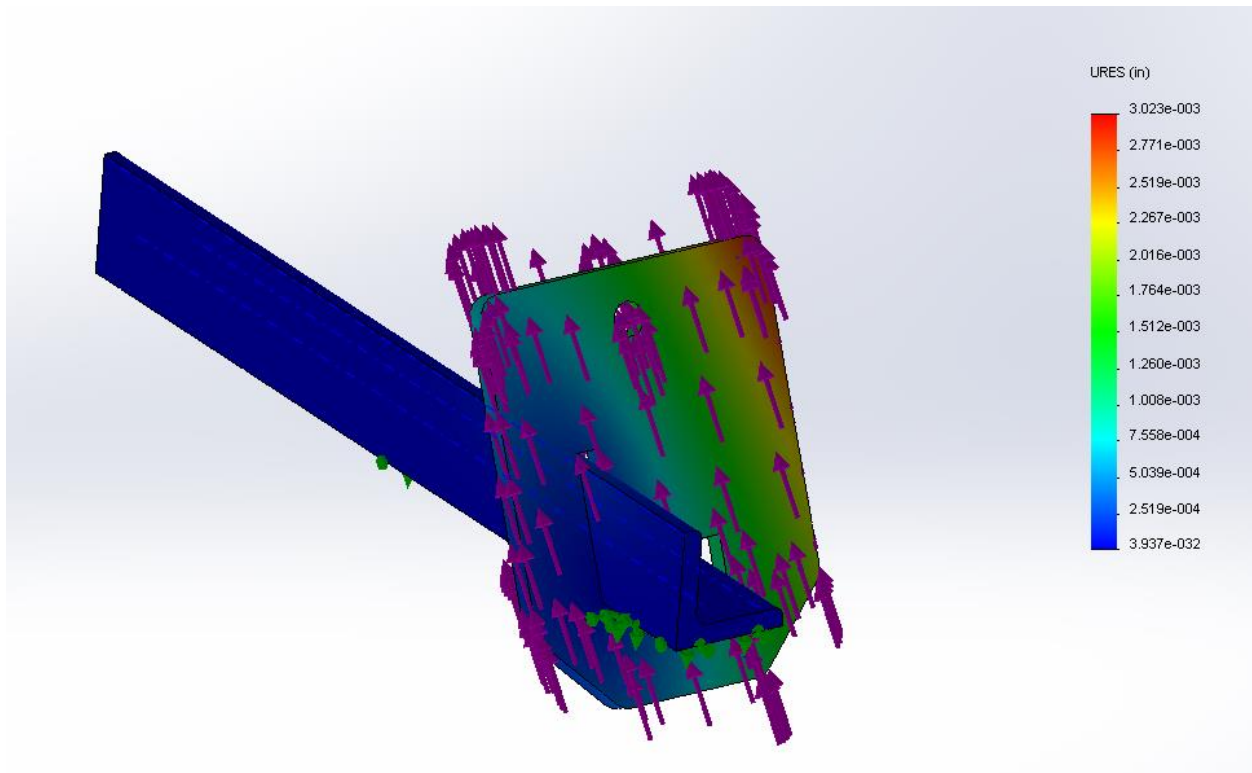
Name	Type	Min	Max
Displacement1	URES: Resultant Displacement	0 in Node: 1	0.00302325 in Node: 2303

Model name: R&D MAIN HOIST EXAMPLE-2
Study name: Main Frame Hoist Bracket-1
Plot type: Static displacement Displacement1



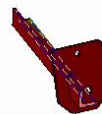
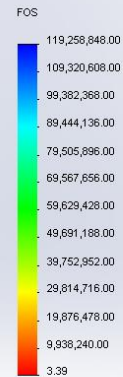
MAIN FRAME HOIST BRACKETS-2 (95-1108)

See next page for zoomed-in view of displacement plot.



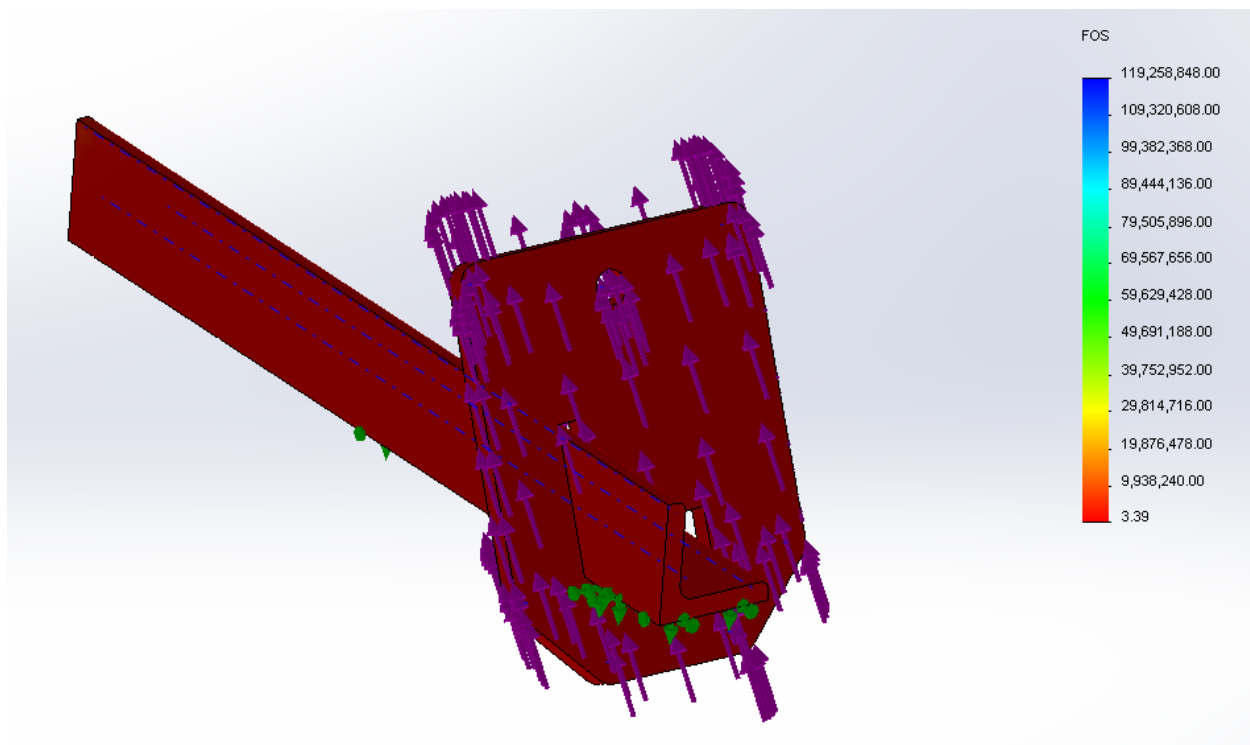
Name	Type	Min	Max
Factor of Safety1	Max von Mises Stress	3.38596 Node: 5065	1.19259e+008 Node: 7822

Model name: R&D MAIN HOIST EXAMPLE-2
Study name: Main Frame Hoist Bracket-1
Plot type: Factor of Safety Factor of Safety1
Criterion: Max von Mises Stress
Factor of safety distribution: Min FOS = 3.4



MAIN FRAME HOIST BRACKETS-2 (95-1108)

See next page for zoomed-in view of factor of safety plot.



Conclusion

After performing the finite element analysis on MAIN FRAME HOIST BRACKETS-2 the maximum stress, maximum displacement and minimum factor of safety are 10708.8 psi, 0.00302325 inches and 3.38596, respectively. The safety factor exceeds the standard requirement of 2 and suggests that the structure is both safe and reliable for the application of one 150-lb force. For the 5/16" chain, Grade 80 (or higher) alloy chain is recommended.