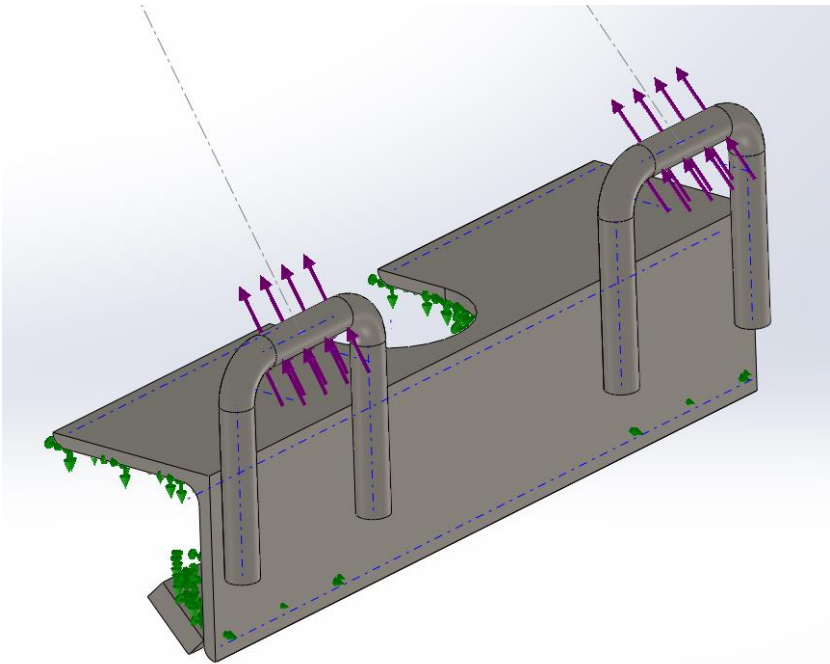




Description

MAIN FRAME HOIST BRACKETS-1 (95-1108) is used at Triple C as a lifting device for truck beds. Two 5/16” chains are attached to this bracket where each chain carries approximately 136-lbs. To overestimate the applied force, two 150-lb loads shall act in the direction specified (52 degrees inclined from the horizontal) in the Solidworks model provided.

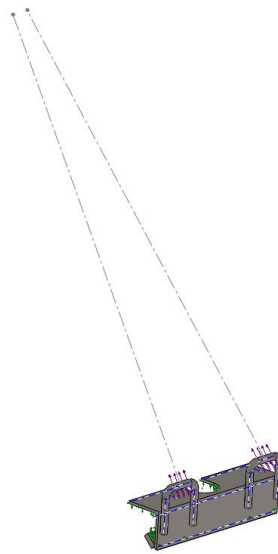
Simulation of MAIN
FRAME HOIST
BRACKETS-1

Date: Monday, April 15, 2013
Designer: John Bartoli
Study name: Study 1
Analysis type: Static

Table of Contents

Description..... 1
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Model Information



Model name: R&D MAIN HOIST EXAMPLE-1
Current Configuration: Default

Solid Bodies

Document Name and Reference	Treated As	Volumetric Properties	Document Path/Date Modified
Imported1	Solid Body	Mass:0.664686 lb Volume:2.34375 in ³ Density:0.283599 lb/in ³ Weight:0.664235 lbf	G:\Triple C Analyses\Main Hoist Example1\FI .5 x 1.25 L 3.75.sldprt Apr 01 11:32:42 2013
Imported1	Solid Body	Mass:0.664686 lb Volume:2.34375 in ³ Density:0.283599 lb/in ³ Weight:0.664235 lbf	G:\Triple C Analyses\Main Hoist Example1\FI .5 x 1.25 L 3.75.sldprt Apr 01 11:32:42 2013



Imported1	Solid Body	Mass:6.63468 lb Volume:23.3945 in ³ Density:0.283599 lb/in ³ Weight:6.63018 lbf	G:\Triple C Analyses\Main Hoist Example1\R&D 10 CHANNEL ANGLE_Default_As Machined_.sldprt Apr 01 11:32:42 2013
Imported1	Solid Body	Mass:0.955482 lb Volume:3.36913 in ³ Density:0.283599 lb/in ³ Weight:0.954834 lbf	G:\Triple C Analyses\Main Hoist Example1\R&D MF HOOK BRKT.sldprt Apr 01 11:32:42 2013
Imported1	Solid Body	Mass:0.955482 lb Volume:3.36913 in ³ Density:0.283599 lb/in ³ Weight:0.954834 lbf	G:\Triple C Analyses\Main Hoist Example1\R&D MF HOOK BRKT.sldprt Apr 01 11:32:42 2013



Study Properties

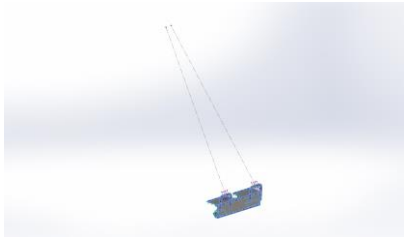
Study name	Study 1
Analysis type	Static
Mesh type	Solid Mesh
Thermal Effect:	On
Thermal option	Include temperature loads
Zero strain temperature	77 Fahrenheit
Include fluid pressure effects from SolidWorks Flow Simulation	Off
Solver type	FFEPlus
Inplane Effect:	Off
Soft Spring:	Off
Inertial Relief:	Off
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

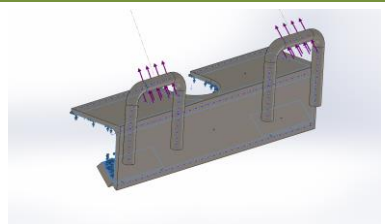
Unit system:	English (IPS)
Length/Displacement	in
Temperature	Fahrenheit
Angular velocity	Hertz
Pressure/Stress	psi

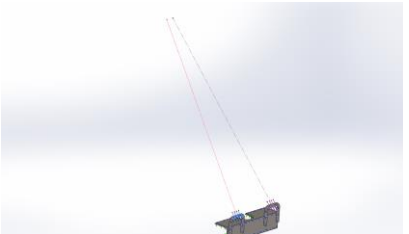


Material Properties

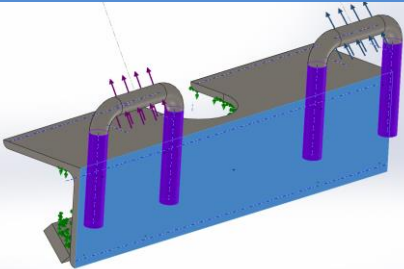
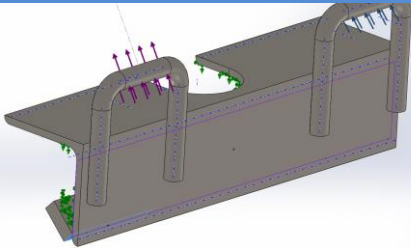
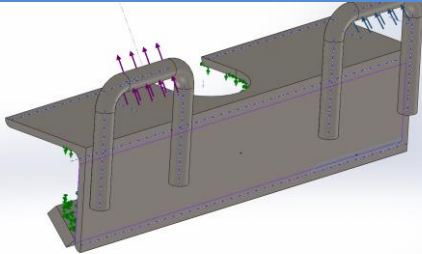
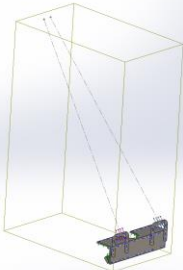
Model Reference	Properties	Components
	Name: ASTM A36 Steel Model type: Linear Elastic Isotropic Default failure criterion: Max von Mises Stress Yield strength: 36259.4 psi Tensile strength: 58015.1 psi Elastic modulus: 2.90075e+007 psi Poisson's ratio: 0.26 Mass density: 0.283599 lb/in ³ Shear modulus: 1.15015e+007 psi	SolidBody 1(Imported1)(R&D 10 CHANNEL ANGLE BRKT.SLDPRT-1/FI .5 x 1.25 L 3.75-1), SolidBody 1(Imported1)(R&D 10 CHANNEL ANGLE BRKT.SLDPRT-1/FI .5 x 1.25 L 3.75-2), SolidBody 1(Imported1)(R&D 10 CHANNEL ANGLE BRKT.SLDPRT-1/R&D 10 CHANNEL ANGLE_Default_As Machined_-1), SolidBody 1(Imported1)(R&D 10 CHANNEL ANGLE BRKT.SLDPRT-1/R&D MF HOOK BRKT-1), SolidBody 1(Imported1)(R&D 10 CHANNEL ANGLE BRKT.SLDPRT-1/R&D MF HOOK BRKT-2)
	Curve Data:N/A	

Loads and Fixtures

Fixture name	Fixture Image	Fixture Details		
Fixed-1		Entities: 5 face(s) Type: Fixed Geometry		
Resultant Forces				
Components	X	Y	Z	Resultant
Reaction force(lbf)	-0.00268627	236.252	182.367	298.45
Reaction Moment(lbf-in)	0	0	0	0

Load name	Load Image	Load Details
Force-1		Entities: 1 face(s) Type: Apply force Values: ---, ---, -150 lbf
Force-2		Entities: 1 face(s) Type: Apply force Values: ---, ---, -150 lbf

Contact Information

Contact	Contact Image	Contact Properties
Contact Set-1		Type: Bonded contact pair Entites: 5 face(s)
Contact Set-2		Type: Bonded contact pair Entites: 2 face(s)
Contact Set-3		Type: Bonded contact pair Entites: 2 face(s)
Global Contact		Type: Bonded Components: 1 component(s) Options: Compatible mesh

Mesh Information

Mesh type	Solid Mesh
Mesher Used:	Standard mesh
Automatic Transition:	Off
Include Mesh Auto Loops:	Off
Jacobian points	4 Points
Element Size	8.29633 mm
Tolerance	0.414816 mm
Mesh Quality	High
Remesh failed parts with incompatible mesh	Off

Mesh Information - Details

Total Nodes	16388
Total Elements	8210
Maximum Aspect Ratio	41.256
% of elements with Aspect Ratio < 3	92.2
% of elements with Aspect Ratio > 10	2
% of distorted elements(Jacobian)	0
Time to complete mesh(hh:mm:ss):	00:00:06
Computer name:	JBARTOLI1



Model name: R&D MAIN HOIST EXAMPLE-1
Study name: Study 1
Mesh type: Solid mesh



Resultant Forces

Reaction Forces

Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	lbf	-0.00268627	236.252	182.367	298.45

Reaction Moments

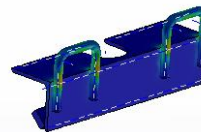
Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	lbf-in	0	0	0	0



Study Results

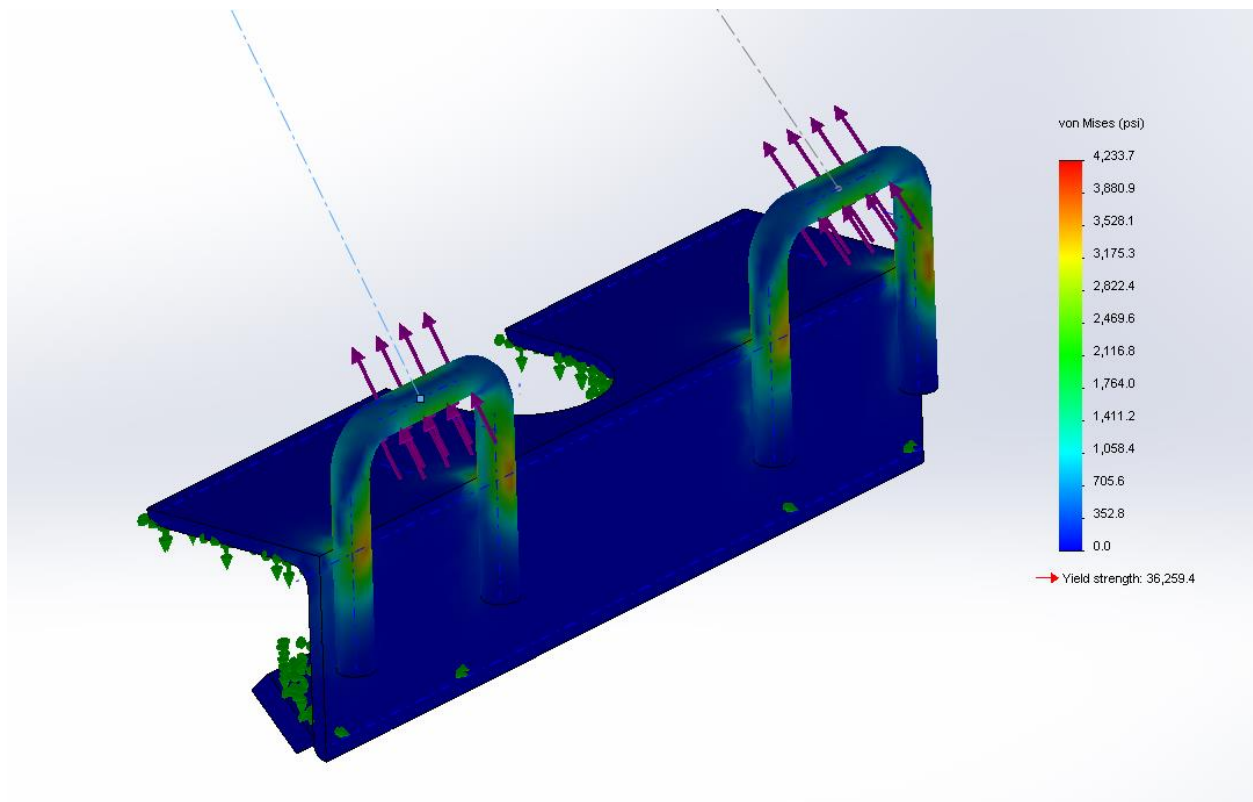
Name	Type	Min	Max
Stress1	VON: von Mises Stress	6.26266e-005 psi Node: 1266	4233.67 psi Node: 16255

Model name: R&D MAIN HOIST EXAMPLE-1
Study name: Study 1
Plot type: Static nodal stress Stress1



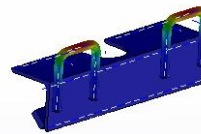
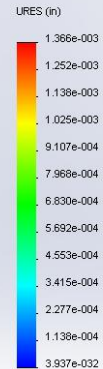
MAIN FRAME HOIST BRACKETS-1 (95-1108)

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



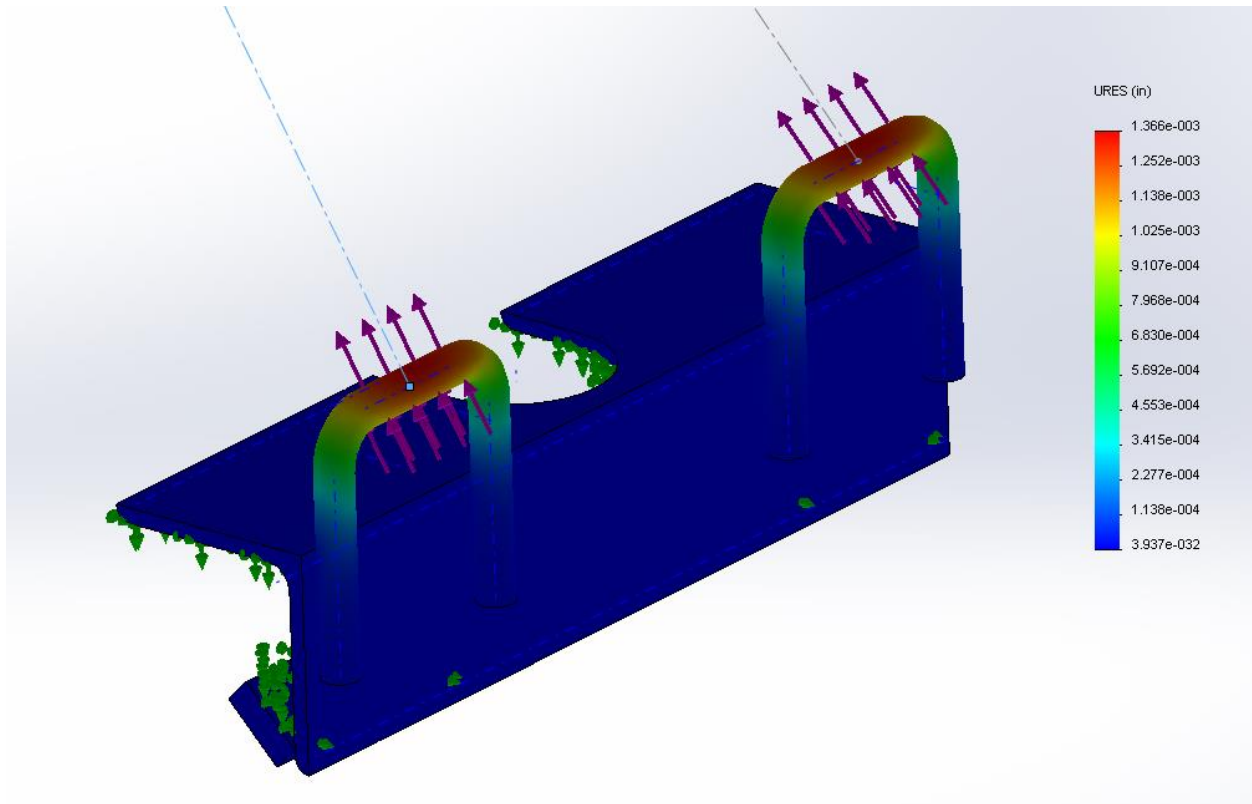
Name	Type	Min	Max
Displacement1	URES: Resultant Displacement	0 in Node: 1	0.00136601 in Node: 14194

Model name: R&D MAIN HOIST EXAMPLE-1
Study name: Study 1
Plot type: Static displacement Displacement1



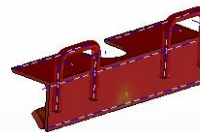
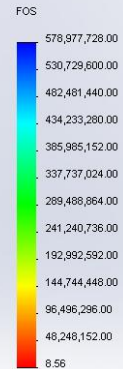
MAIN FRAME HOIST BRACKETS-1 (95-1108)

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



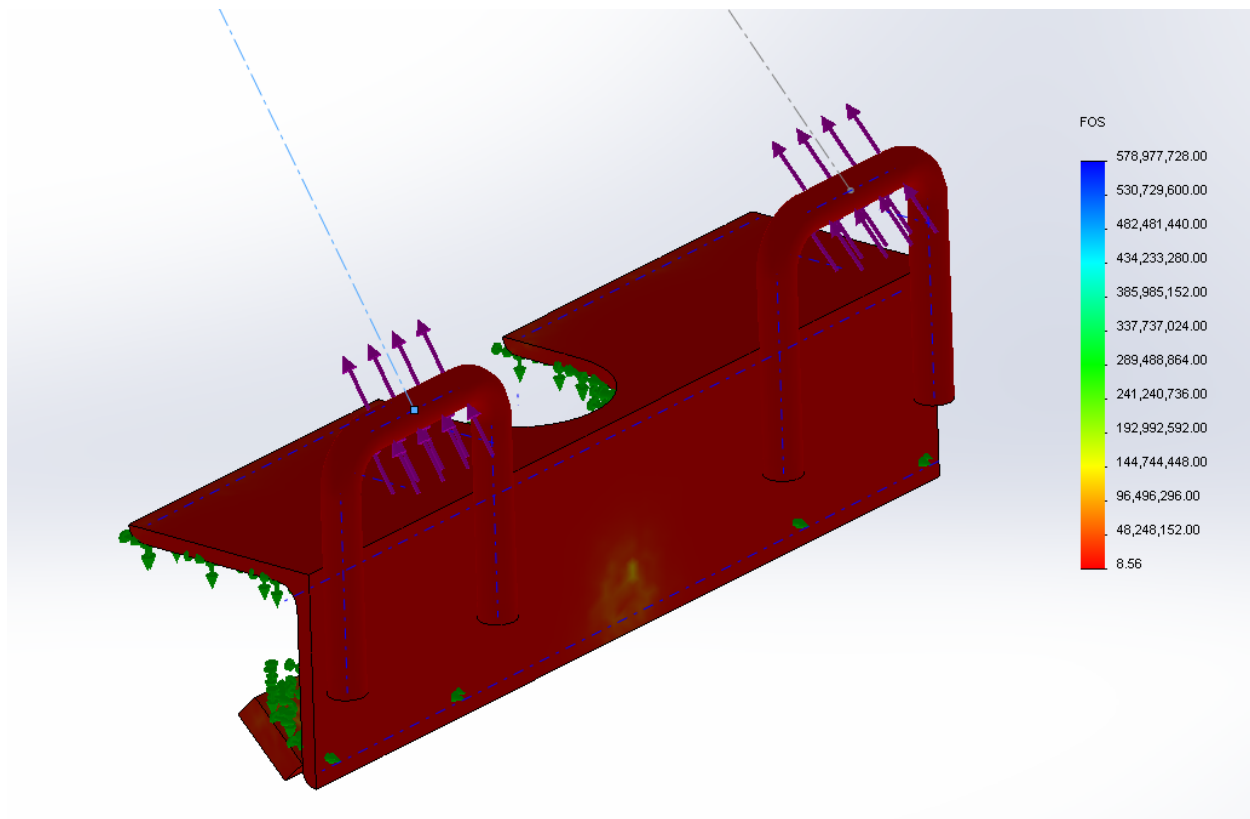
Name	Type	Min	Max
Factor of Safety1	Max von Mises Stress	8.56453 Node: 16255	5.78978e+008 Node: 1266

Model name: R&D MAIN HOIST EXAMPLE-1
Study name: Study 1
Plot type: Factor of Safety Factor of Safety1
Criterion: Max von Mises Stress
Factor of safety distribution: Min FOS = 8.6



MAIN FRAME HOIST BRACKETS-1 (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-1 the maximum stress, maximum displacement and minimum factor of safety are 4233.67 psi, 0.00136601 inches and 8.56453, respectively. The safety factor far exceeds the standard requirement of 2 and suggests that the structure is both safe and reliable for two 150-lb forces. For the 5/16" chain, Grade 80 (or higher) alloy chain is recommended.