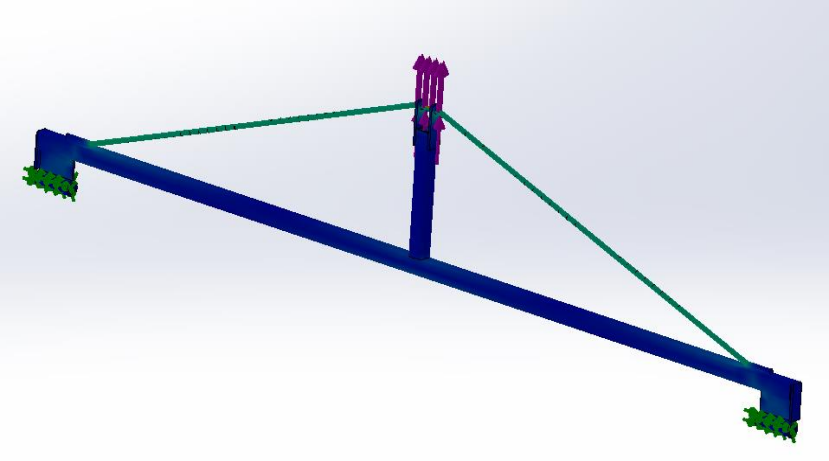
HCC, inc.
1501 1st Avenue
Mendota, IL 61342
Phone: 815-539-9371 Ext 262



Simulation of REAR ASSEMBLY LIFTING HOIST 100 SERIES

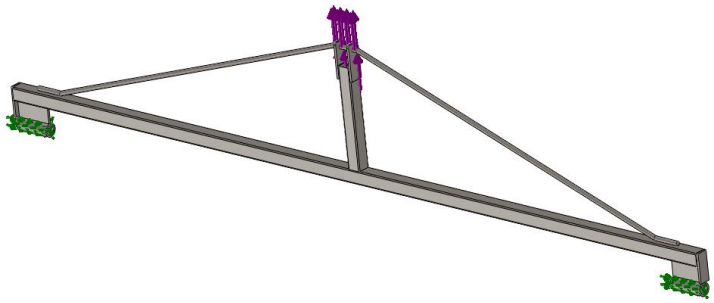
Date: Monday, April 15, 2013
Designer: John Bartoli
Study name: Study 3
Analysis type: Static

Table of Contents

Description

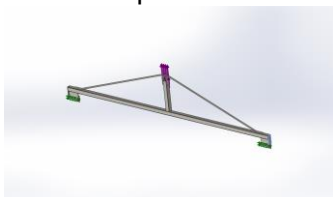
REAR ASSEMBLY LIFTING HOIST 100 SERIES (95-1110) is used at Triple C as a lifting device for truck beds. It utilizes pin connections to securely hoist 415-lbs. In overestimation of the applied force, the truss structure shall be given a vertical upward 500-lb load.

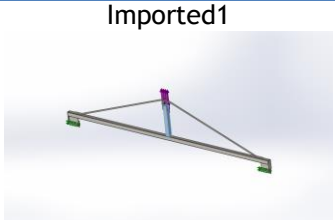
Model Information

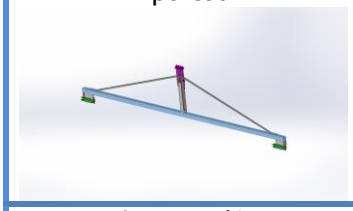


Model name: R&D REAR ASM HOIST 100_1-3
Current Configuration: Default

Solid Bodies

Document Name and Reference	Treated As	Volumetric Properties	Document Path/Date Modified
Imported1 	Solid Body	**Mass:0.299109 lb** **Volume:1.05469 in^3** **Density:0.283599 lb/in^3** **Weight:0.298906 lbf**	**G:\TripleC-Forklift Boom\FI .25 X 1.25 L 3.375_2.sldprt** Apr 01 12:46:20 2013
Imported1 	Solid Body	**Mass:0.299109 lb** **Volume:1.05469 in^3** **Density:0.283599 lb/in^3** **Weight:0.298906 lbf**	**G:\TripleC-Forklift Boom\FI .25 X 1.25 L 3.375_2.sldprt** Apr 01 12:46:20 2013

Imported1 	Solid Body	**Mass:0.407778 lb Volume:1.43787 in^3 Density:0.283599 lb/in^3 Weight:0.407502 lbf**	**G:\TripleC-Forklift Boom\FI .25 X 1.5 L 4 with hole_1.sldprt** Apr 01 12:46:19 2013
Imported1 	Solid Body	**Mass:0.407778 lb Volume:1.43787 in^3 Density:0.283599 lb/in^3 Weight:0.407502 lbf**	**G:\TripleC-Forklift Boom\FI .25 X 1.5 L 4 with hole_1.sldprt** Apr 01 12:46:19 2013
Imported1 	Solid Body	**Mass:0.567198 lb Volume:2 in^3 Density:0.283599 lb/in^3 Weight:0.566814 lbf**	**G:\TripleC-Forklift Boom\FI .25 X 2 L 4_2.sldprt** Apr 01 12:46:20 2013
Imported1 	Solid Body	**Mass:0.567198 lb Volume:2 in^3 Density:0.283599 lb/in^3 Weight:0.566814 lbf**	**G:\TripleC-Forklift Boom\FI .25 X 2 L 4_2.sldprt** Apr 01 12:46:20 2013
Imported1 	Solid Body	**Mass:5.05734 lb Volume:17.8327 in^3 Density:0.283599 lb/in^3 Weight:5.05391 lbf**	**G:\TripleC-Forklift Boom\R&D ROUND top stringer_1.sldprt** Apr 01 12:46:19 2013
Imported1 	Solid Body	**Mass:2.11667 lb Volume:7.4636 in^3 Density:0.283599 lb/in^3 Weight:2.11524 lbf**	**G:\TripleC-Forklift Boom\ST 1.5 x .120 L 11.5_Default_As Machined__1.sldprt** Apr 01 12:46:20 2013

Imported1 	Solid Body	**Mass:17.0254 lb** **Volume:60.0333 in^3** **Density:0.283599 lb/in^3** **Weight:17.0139 lbf**	**G:\TripleC-Forklift Boom\ST 1.5 x .120 L 92.5_Default_As Machined__1.sldprt** Apr 01 12:46:20 2013
Imported1 	Solid Body	**Mass:1.05576 lb** **Volume:3.72271 in^3** **Density:0.283599 lb/in^3** **Weight:1.05504 lbf**	**G:\TripleC-Forklift Boom\ST-MT 1.500x1.032 L 4_2.sldprt** Apr 01 12:46:19 2013
Imported1 	Solid Body	**Mass:1.05576 lb** **Volume:3.72271 in^3** **Density:0.283599 lb/in^3** **Weight:1.05504 lbf**	**G:\TripleC-Forklift Boom\ST-MT 1.500x1.032 L 4_2.sldprt** Apr 01 12:46:19 2013

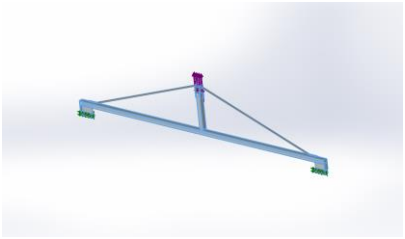
Study Properties

Study name	Study 3
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)

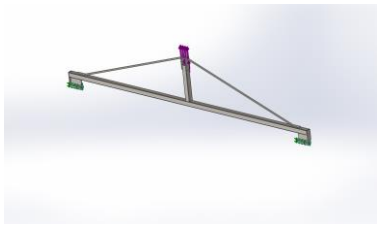
Units

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

Material Properties

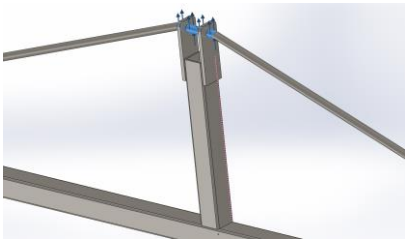
Model Reference	Properties	Components
	**Name:** ASTM A36 Steel **Model type:** Linear Elastic Isotropic **Default failure criterion:** Max von Mises Stress **Yield strength:** 36259.4 psi **Tensile strength:** 58015.1 psi **Elastic modulus:** 2.90075e+007 psi **Poisson's ratio:** 0.26 **Mass density:** 0.283599 lb/in^3 **Shear modulus:** 1.15015e+007 psi	SolidBody 1(Imported1)(FI .25 X 1.25 L 3.375_2-1), SolidBody 1(Imported1)(FI .25 X 1.25 L 3.375_2-2), SolidBody 1(Imported1)(FI .25 X 1.5 L 4 with hole_1-1), SolidBody 1(Imported1)(FI .25 X 1.5 L 4 with hole_1-2), SolidBody 1(Imported1)(FI .25 X 2 L 4_2-1), SolidBody 1(Imported1)(FI .25 X 2 L 4_2-2), SolidBody 1(Imported1)(R&D ROUND top stringer_1-1), SolidBody 1(Imported1)(ST 1.5 x .120 L 11.5_Default_As Machined__1-1), SolidBody 1(Imported1)(ST 1.5 x .120 L 92.5_Default_As Machined__1-1), SolidBody 1(Imported1)(ST-MT 1.500x1.032 L 4_2-1), SolidBody 1(Imported1)(ST-MT 1.500x1.032 L 4_2-2)
Curve Data:N/A		

Loads and Fixtures

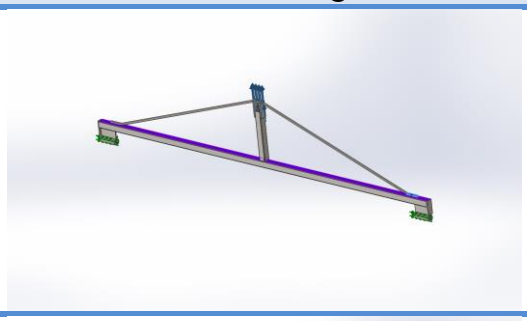
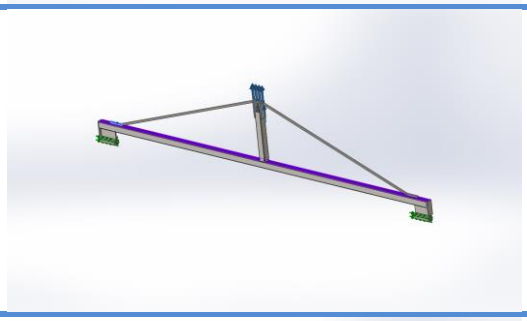
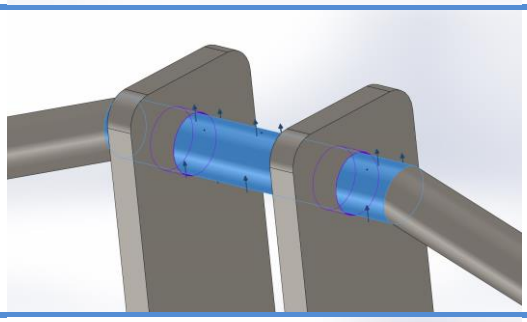
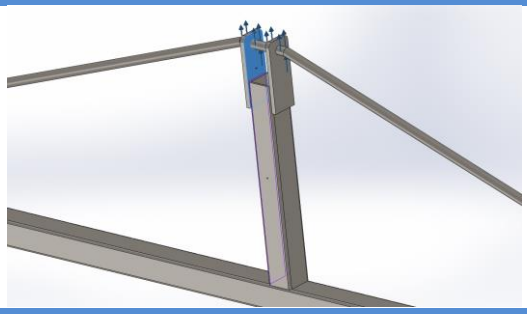
Fixture name	Fixture Image	Fixture Details
Fixed Hinge-1		**Entities:** 2 face(s) **Type:** Fixed Hinge

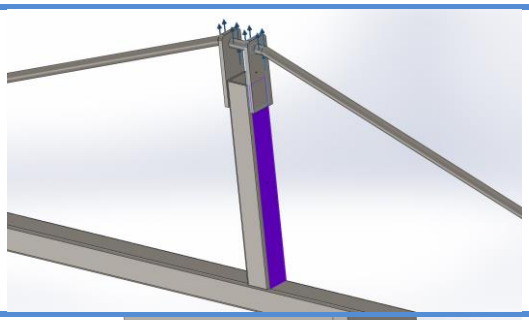
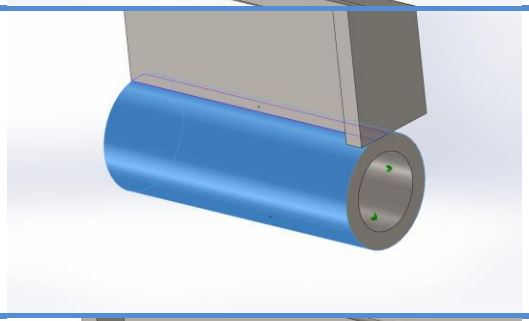
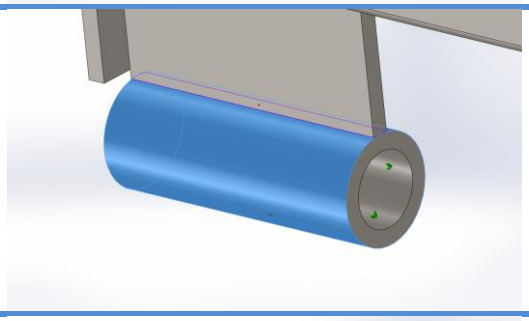
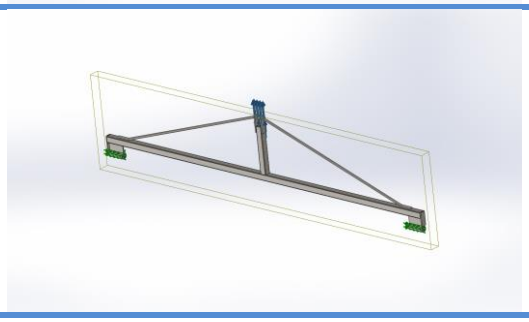
Resultant Forces

Components	X	Y	Z	Resultant
Reaction force(lbf)	449.994	-0.0605399	-0.426297	449.994
Reaction Moment(lbf-in)	0	0	0	0

Load name	Load Image	Load Details
Force-1		**Entities:** 1 face(s) **Reference:** Edge< 1 > **Type:** Apply force **Values:** ---, ---, 450 lbf

Contact Information

Contact	Contact Image	Contact Properties
Contact Set-1		**Type:** Bonded contact pair **Entites:** 2 face(s)
Contact Set-2		**Type:** Bonded contact pair **Entites:** 2 face(s)
Contact Set-3		**Type:** Bonded contact pair **Entites:** 3 face(s)
Contact Set-4		**Type:** Bonded contact pair **Entites:** 2 face(s)

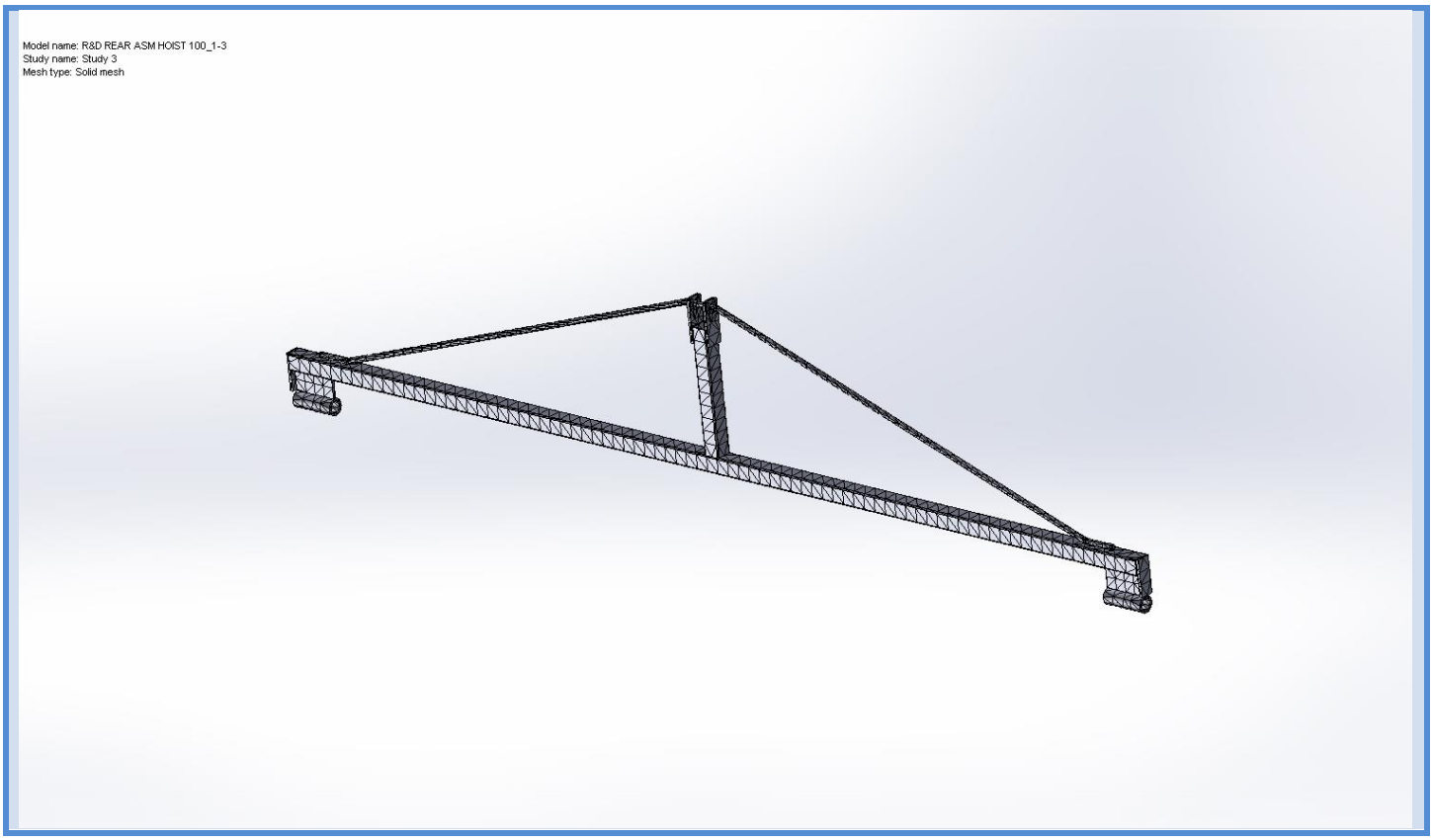
Contact Set-5		**Type:** Bonded contact pair **Entites:** 2 face(s)
Contact Set-6		**Type:** Bonded contact pair **Entites:** 2 face(s)
Contact Set-7		**Type:** Bonded contact pair **Entites:** 2 face(s)
Global Contact		**Type:** Bonded **Components:** 1 component(s) **Options:** Compatible mesh

Mesh Information

Mesh type	Solid Mesh
Mesher Used:	Standard mesh
Automatic Transition:	Off
Include Mesh Auto Loops:	Off
Jacobian points	4 Points
Element Size	29.2609 mm
Tolerance	1.46305 mm
Mesh Quality	High
Remesh failed parts with incompatible mesh	Off

Mesh Information - Details

Total Nodes	12729
Total Elements	6125
Maximum Aspect Ratio	44.122
% of elements with Aspect Ratio < 3	7.27
% of elements with Aspect Ratio > 10	47.1
% of distorted elements(Jacobian)	0
Time to complete mesh(hh;mm;ss):	00:00:08
Computer name:	JBARTOLI1



Resultant Forces

Reaction Forces

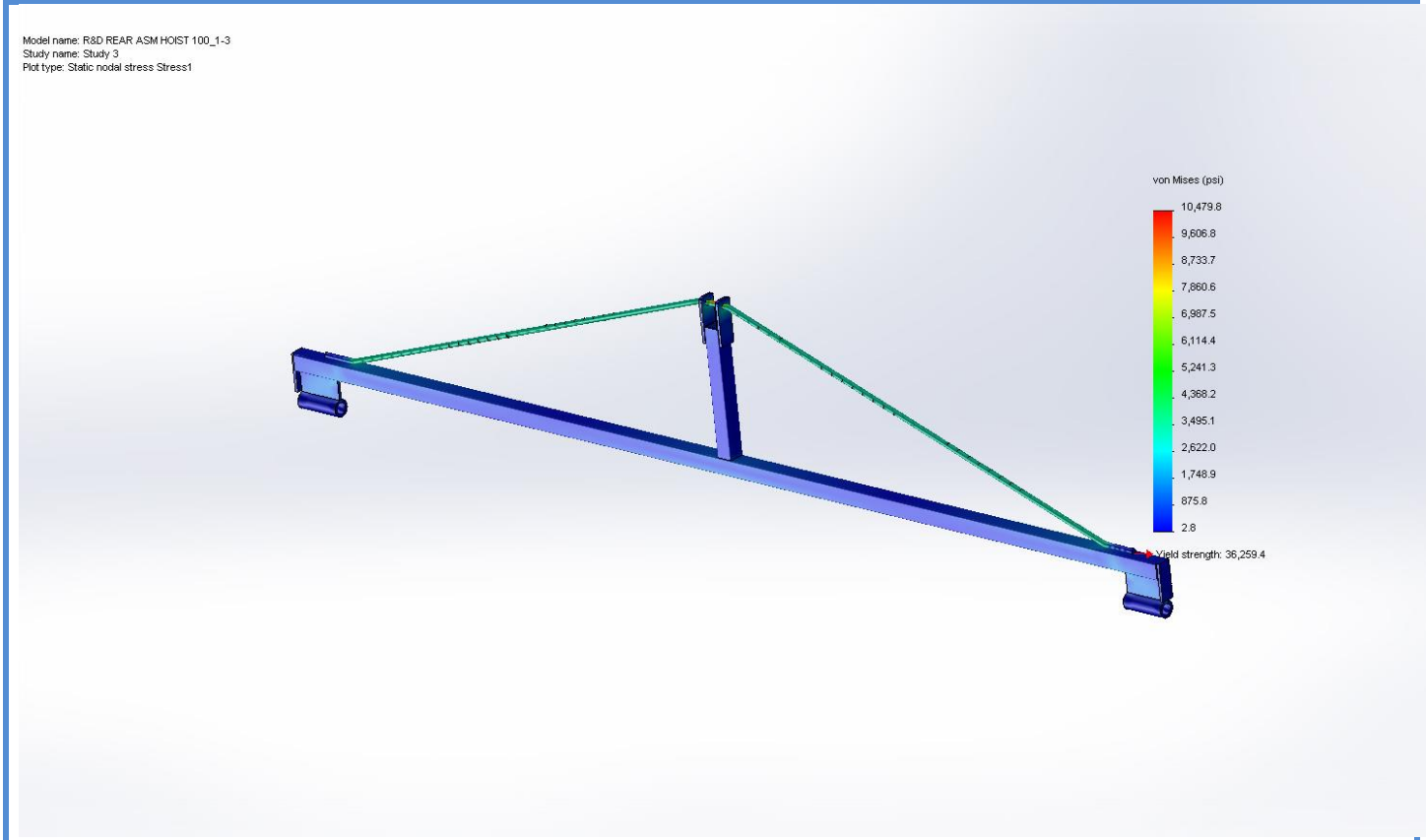
Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	lbf	449.994	-0.0605399	-0.426297	449.994

Reaction Moments

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

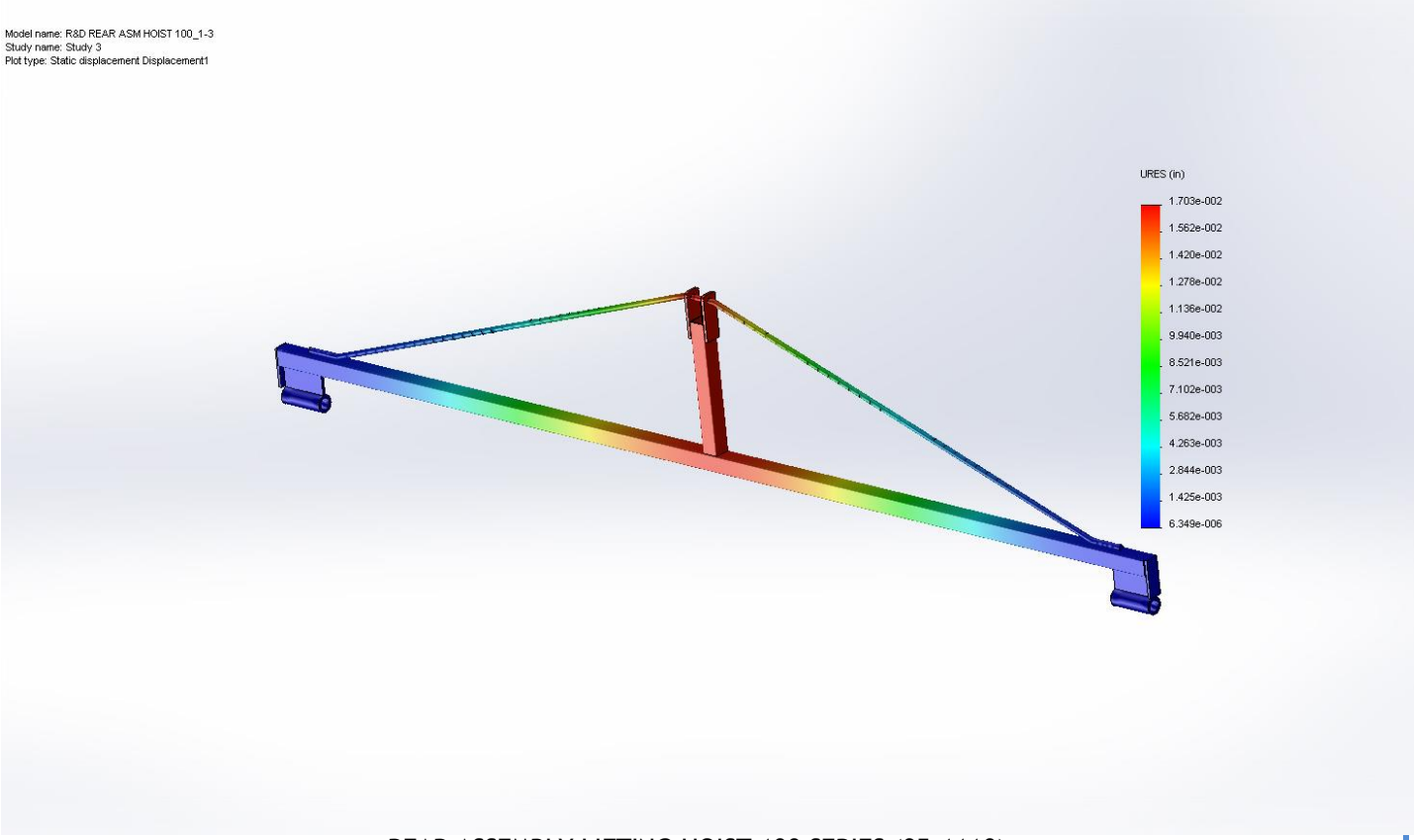
Study Results

Name	Type	Min	Max
Stress1	VON: von Mises Stress	2.75693 psi Node: 12519	10479.8 psi Node: 1743



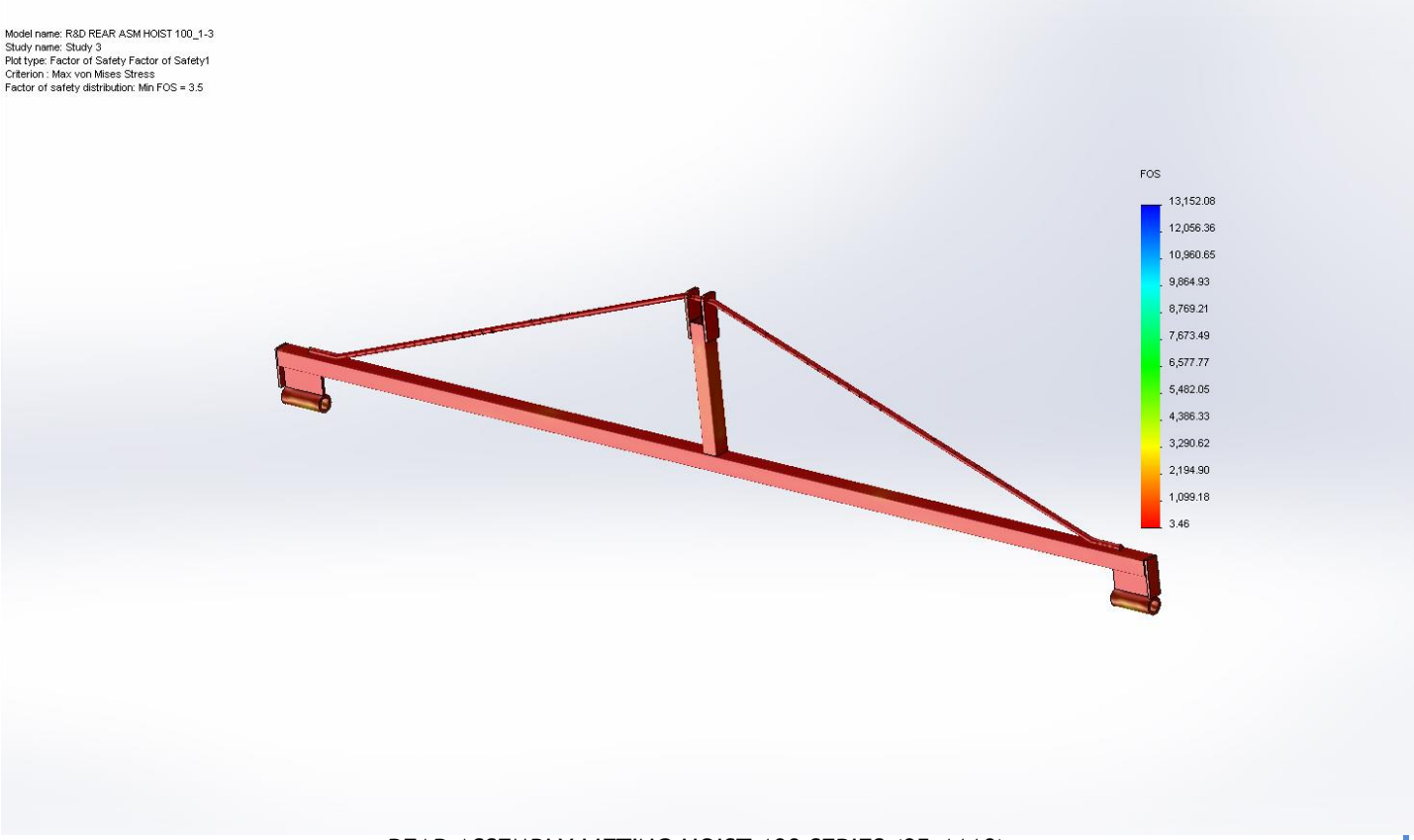
REAR ASSEMBLY LIFTING HOIST 100 SERIES (95-1110)

Name	Type	Min	Max
Displacement1	URES: Resultant Displacement	6.34852e-006 in Node: 12489	0.0170347 in Node: 1751



REAR ASSEMBLY LIFTING HOIST 100 SERIES (95-1110)

Name	Type	Min	Max
Factor of Safety1	Max von Mises Stress	3.45992 Node: 1743	13152.1 Node: 12519



REAR ASSEMBLY LIFTING HOIST 100 SERIES (95-1110)

Conclusion

After performing the finite element analysis on REAR ASSEMBLY LIFTING HOIST 100 SERIES the maximum stress, maximum displacement and minimum factor of safety are 10479.8 psi, 0.0170347 inches and 3.45992, respectively. The safety factor exceeds the standard requirement of 2 and suggests that the structure is both safe and reliable under the application of a 500-lb force.