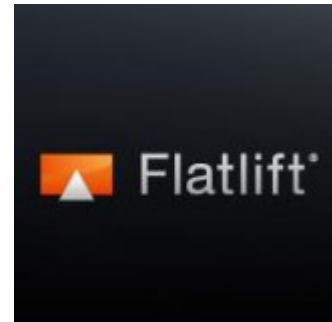


Reactions analysis



Analyzed File:	Main & Bracket frames-01.iam
Version:	
Creation Date:	1/28/2017, 7:36 PM
Simulation Author:	George Vasileiadis
Summary:	

Project Info (iProperties)

Summary

Author	George Vasileiadis
Company	FLATLIFT GmbH

Project

Part Number	Main & Bracket frames-01
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Physical

Mass	139.970 kg
Center of Gravity	x=1012.677 mm y=-3258.176 mm z=1559.336 mm

Main & bracket frame analysis:1

General objective and settings:

Simulation Type	Static Analysis
Last Modification Date	1/28/2017, 7:09 PM

Material(s)

Name	Steel, Mild	
General	Mass Density	7.850 g/cm ³
	Yield Strength	207.000 MPa
	Ultimate Tensile Strength	345.000 MPa
Stress	Young's Modulus	220.000 GPa
	Poisson's Ratio	0.275 ul
Part Name(s)	DIN 40 x 40 x 2 00000001.ipt DIN 40 x 40 x 2 00000002.ipt DIN 40 x 40 x 2 00000004.ipt DIN 40 x 40 x 2 00000016.ipt DIN 40 x 40 x 2 00000017.ipt DIN 40 x 40 x 2 00000019.ipt DIN 40 x 40 x 2 00000023.ipt DIN 40 x 40 x 2 00000030.ipt DIN 40 x 40 x 2 00000031.ipt DIN 40 x 40 x 2 00000034.ipt	

Name	S 235 JRH	
General	Mass Density	7.850 g/cm ³
	Yield Strength	207.000 MPa
	Ultimate Tensile Strength	345.000 MPa
Stress	Young's Modulus	220.000 GPa
	Poisson's Ratio	0.275 ul
Part Name(s)	DIN 40 x 40 x 2 00000003.ipt DIN 40 x 40 x 2 00000005.ipt DIN 40 x 40 x 2 00000006.ipt DIN 40 x 40 x 2 00000009.ipt DIN 40 x 40 x 2 00000022.ipt DIN 40 x 40 x 2 00000023.ipt DIN 40 x 40 x 2 00000025.ipt DIN 40 x 40 x 2 00000030.ipt DIN 40 x 40 x 2 00000031.ipt DIN 40 x 40 x 2 00000034.ipt DIN 40 x 40 x 2 00000036.ipt DIN 40 x 40 x 2 00000037.ipt DIN 40 x 40 x 2 00000001.ipt DIN 40 x 40 x 2 00000002.ipt DIN 40 x 40 x 2 00000003.ipt DIN 40 x 40 x 2 00000004.ipt DIN 40 x 40 x 2 00000005.ipt DIN 40 x 40 x 2 00000006.ipt	

DIN 40 x 40 x 2 00000007.ipt
DIN 40 x 40 x 2 00000008.ipt
DIN 40 x 40 x 2 00000009.ipt
DIN 40 x 40 x 2 00000010.ipt
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DIN 40 x 40 x 2 00000012.ipt
DIN 40 x 40 x 2 00000013.ipt
DIN 40 x 40 x 2 00000014.ipt
DIN 40 x 40 x 2 00000015.ipt
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DIN 40 x 40 x 2 00000019.ipt
DIN 40 x 40 x 2 00000020.ipt
DIN 40 x 40 x 2 00000021.ipt
DIN 40 x 40 x 2 00000022.ipt
DIN 40 x 40 x 2 00000023.ipt
DIN 40 x 40 x 2 00000039.ipt

Cross Section(s)

Geometry Properties	Section Area (A)	293.699 mm ²
	Section Width	40.000 mm
	Section Height	40.000 mm
	Section Centroid (x)	20.000 mm
	Section Centroid (y)	20.000 mm
Mechanical Properties	Moment of Inertia (I _x)	69402.135 mm ⁴
	Moment of Inertia (I _y)	69402.135 mm ⁴
	Torsional Rigidity Modulus (J)	113000.000 mm ⁴
	Section Modulus (W _x)	3470.107 mm ³
	Section Modulus (W _y)	3470.107 mm ³
	Torsional Section Modulus (W _t)	5230.000 mm ³
	Reduced Shear Area (A _v)	134.310 mm ²
	Reduced Shear Area (A _v)	134.310 mm ²
Part Name(s)	DIN 40 x 40 x 2 00000001.ipt DIN 40 x 40 x 2 00000002.ipt DIN 40 x 40 x 2 00000003.ipt DIN 40 x 40 x 2 00000004.ipt DIN 40 x 40 x 2 00000005.ipt DIN 40 x 40 x 2 00000006.ipt DIN 40 x 40 x 2 00000009.ipt DIN 40 x 40 x 2 00000016.ipt DIN 40 x 40 x 2 00000017.ipt DIN 40 x 40 x 2 00000022.ipt DIN 40 x 40 x 2 00000019.ipt DIN 40 x 40 x 2 00000023.ipt DIN 40 x 40 x 2 00000030.ipt	

	DIN 40 x 40 x 2 00000031.ipt
	DIN 40 x 40 x 2 00000034.ipt
	DIN 40 x 40 x 2 00000036.ipt
	DIN 40 x 40 x 2 00000037.ipt
	DIN 40 x 40 x 2 00000001.ipt
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	DIN 40 x 40 x 2 00000017.ipt
	DIN 40 x 40 x 2 00000018.ipt
	DIN 40 x 40 x 2 00000019.ipt
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	DIN 40 x 40 x 2 00000021.ipt
	DIN 40 x 40 x 2 00000022.ipt
	DIN 40 x 40 x 2 00000023.ipt
	DIN 40 x 40 x 2 00000039.ipt

Geometry Properties	Section Area (A)	293.699 mm^2
	Section Width	40.000 mm

	Section Height	40.000 mm
	Section Centroid (x)	20.000 mm
	Section Centroid (y)	20.000 mm
Mechanical Properties	Moment of Inertia (I_x)	69402.135 mm ⁴
	Moment of Inertia (I_y)	69402.135 mm ⁴
	Torsional Rigidity Modulus (J)	102565.437 mm ⁴
	Section Modulus (W_x)	3470.107 mm ³
	Section Modulus (W_y)	3470.107 mm ³
	Torsional Section Modulus (W_z)	0.000 mm ³
	Reduced Shear Area (A_x)	134.310 mm ²
	Reduced Shear Area (A_y)	134.310 mm ²
Part Name(s)	DIN 40 x 40 x 2 00000025.ipt	

Operating conditions

Gravity

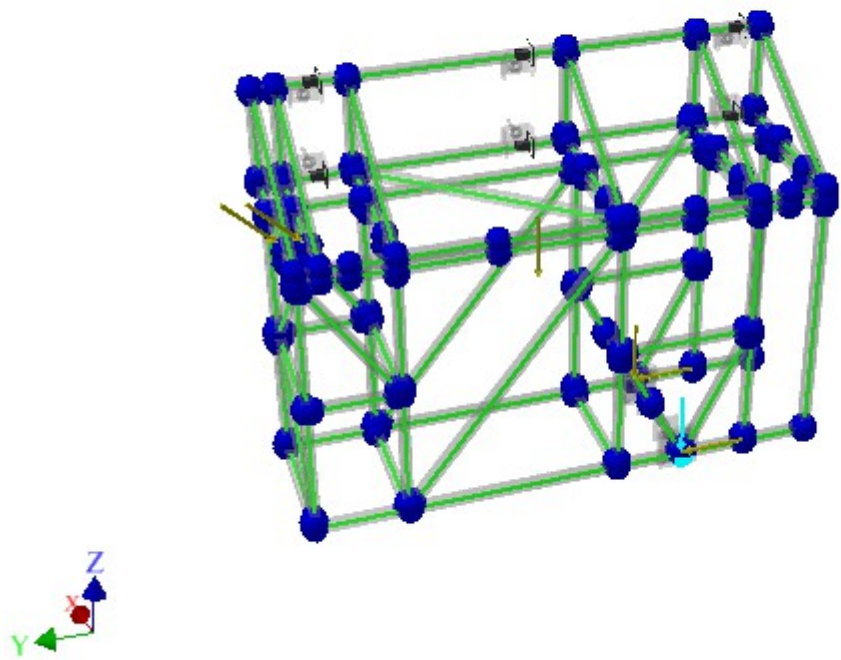
Load Type	Gravity
Magnitude	9810.000 mm/s ²
Direction	Z-

Vertical main load -01

Load Type	Force
-----------	-------

Magnitude	2000.000 N
Beam Coordinate System	No
Angle of Plane	270.00 deg
Angle in Plane	180.00 deg
Fx	0.000 N
Fy	-0.000 N
Fz	-2000.000 N

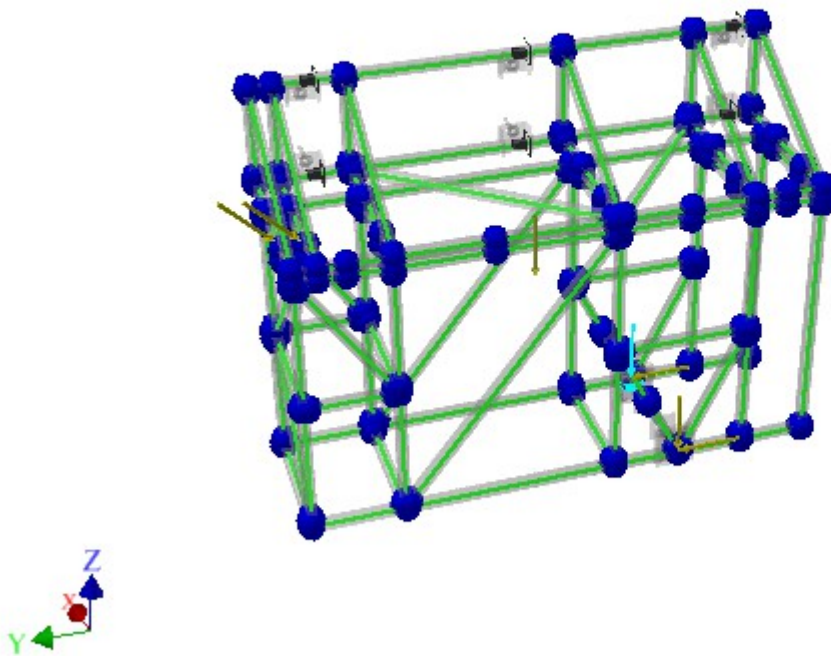
Selected Reference(s)



Vertical main load -02

Load Type	Force
Magnitude	2000.000 N
Beam Coordinate System	No
Angle of Plane	270.00 deg
Angle in Plane	180.00 deg
Fx	0.000 N
Fy	-0.000 N
Fz	-2000.000 N

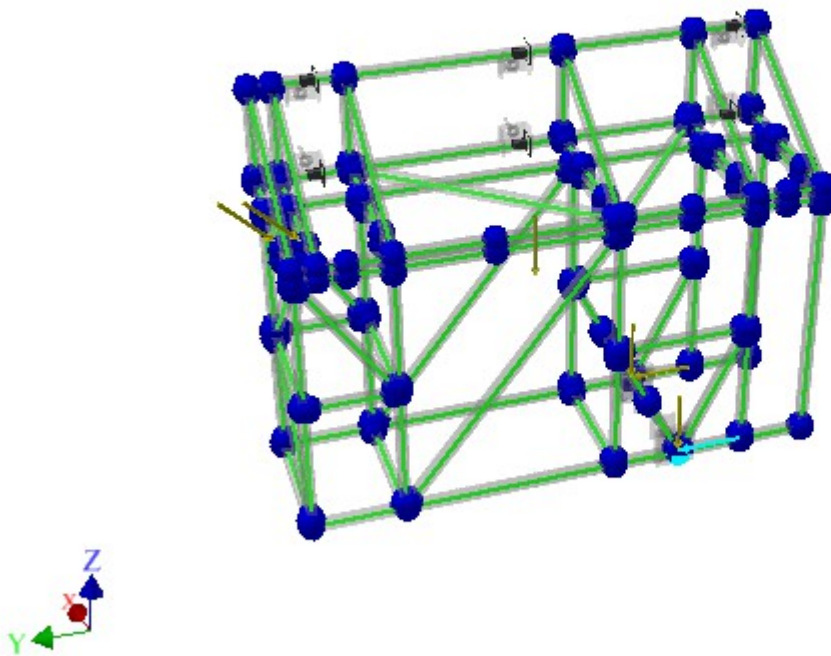
Selected Reference(s)



Horizontal axle load -01

Load Type	Force
Magnitude	1000.000 N
Beam Coordinate System	No
Angle of Plane	90.00 deg
Angle in Plane	90.00 deg
Fx	0.000 N
Fy	1000.000 N
Fz	-0.000 N

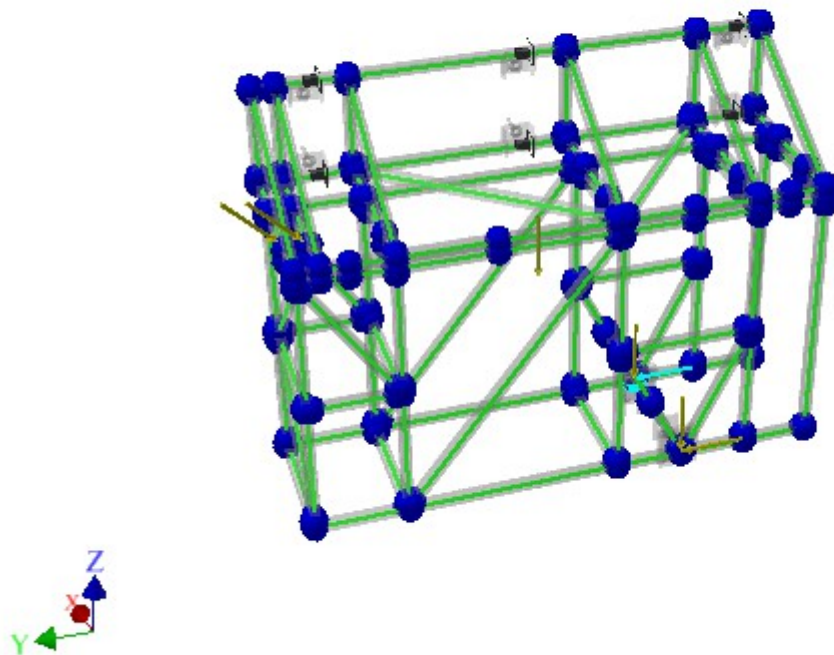
Selected Reference(s)



Horizontal axle load -02

Load Type	Force
Magnitude	1000.000 N
Beam Coordinate System	No
Angle of Plane	90.00 deg
Angle in Plane	90.00 deg
Fx	0.000 N
Fy	1000.000 N
Fz	0.000 N

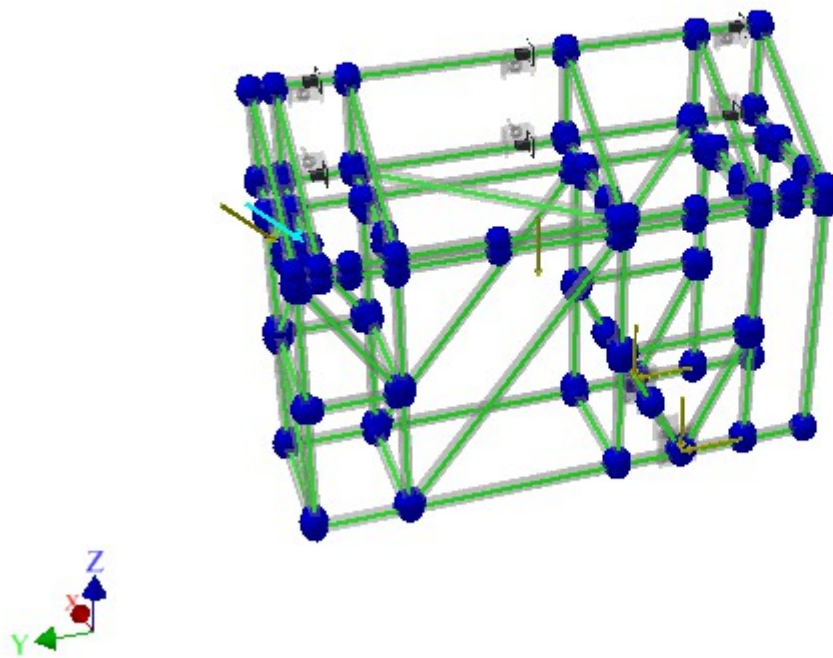
Selected Reference(s)



Lifting motor load -01

Load Type	Force
Magnitude	2500.000 N
Beam Coordinate System	No
Angle of Plane	270.00 deg
Angle in Plane	135.00 deg
Fx	0.000 N
Fy	-1767.767 N
Fz	-1767.767 N
Offset	235.665 mm

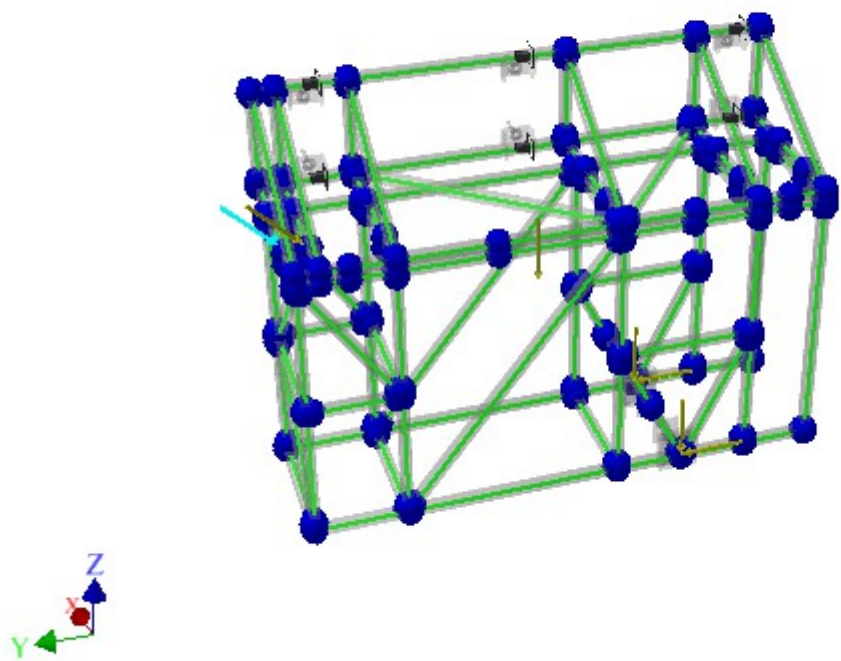
Selected Reference(s)



Lifting motor load -02

Load Type	Force
Magnitude	2000.000 N
Beam Coordinate System	No
Angle of Plane	270.00 deg
Angle in Plane	135.00 deg
Fx	0.000 N
Fy	-1414.214 N
Fz	-1414.214 N
Offset	271.413 mm

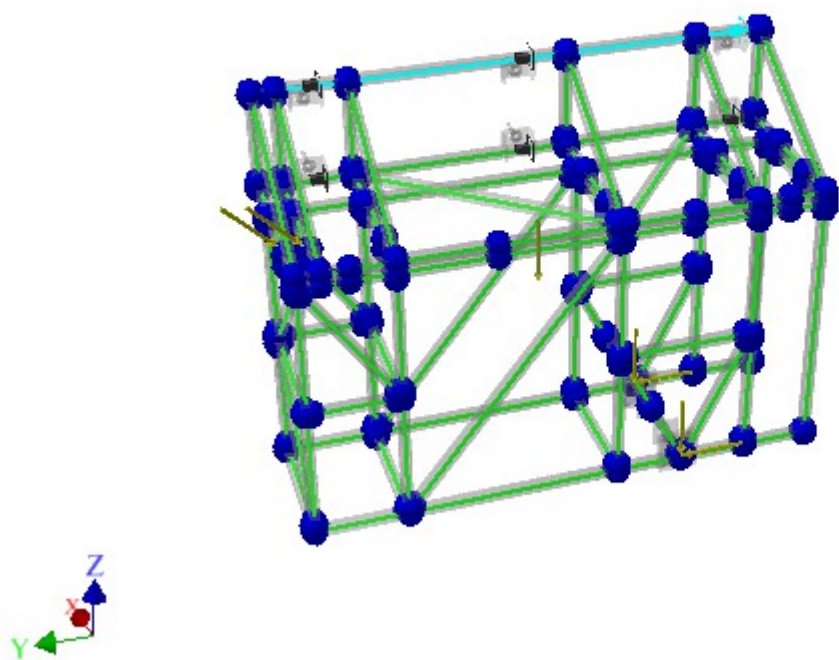
Selected Reference(s)



Fixed Constraint:1

Constraint Type	Fixed
Offset	1745.000 mm

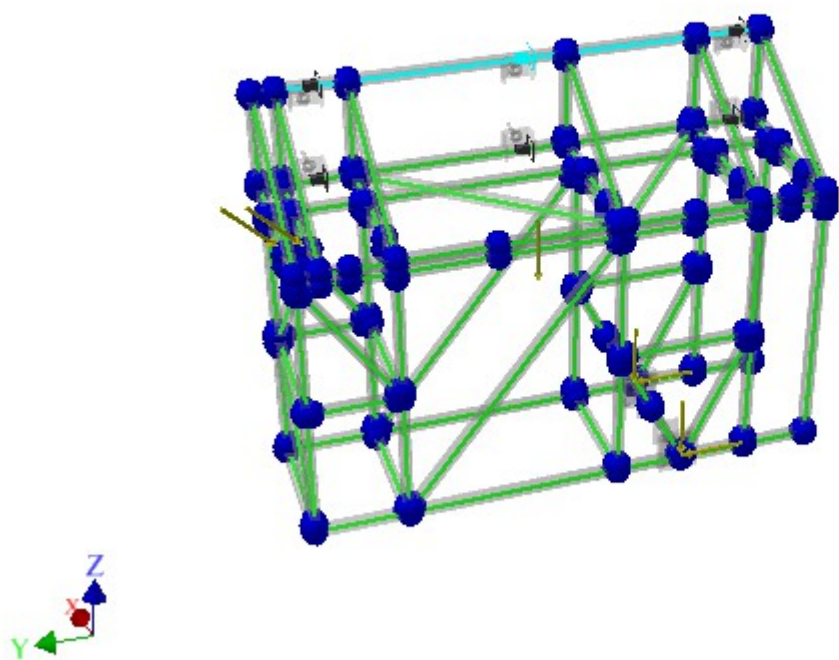
Selected Reference(s)



Fixed Constraint:2

Constraint Type	Fixed
Offset	930.000 mm

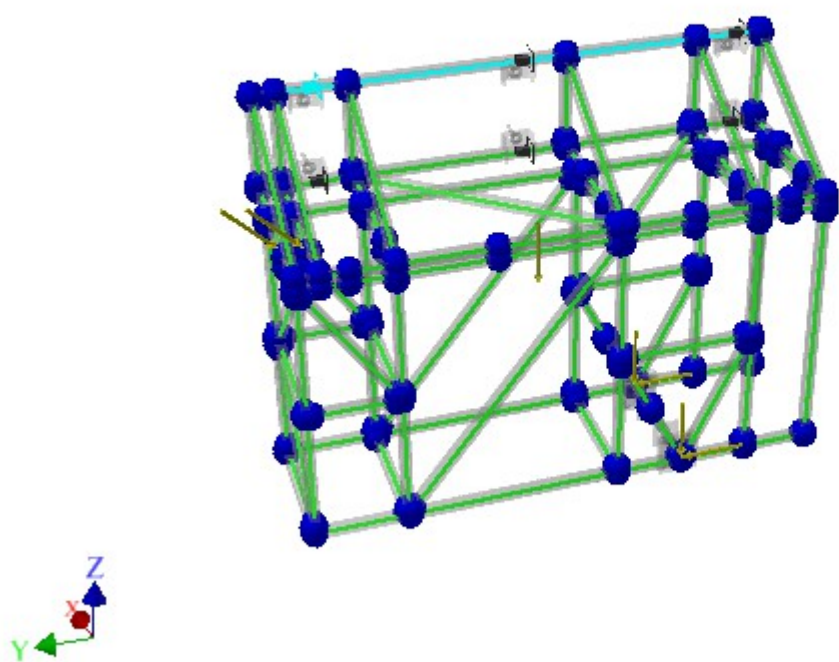
Selected Reference(s)



Fixed Constraint:3

Constraint Type	Fixed
Offset	180.000 mm

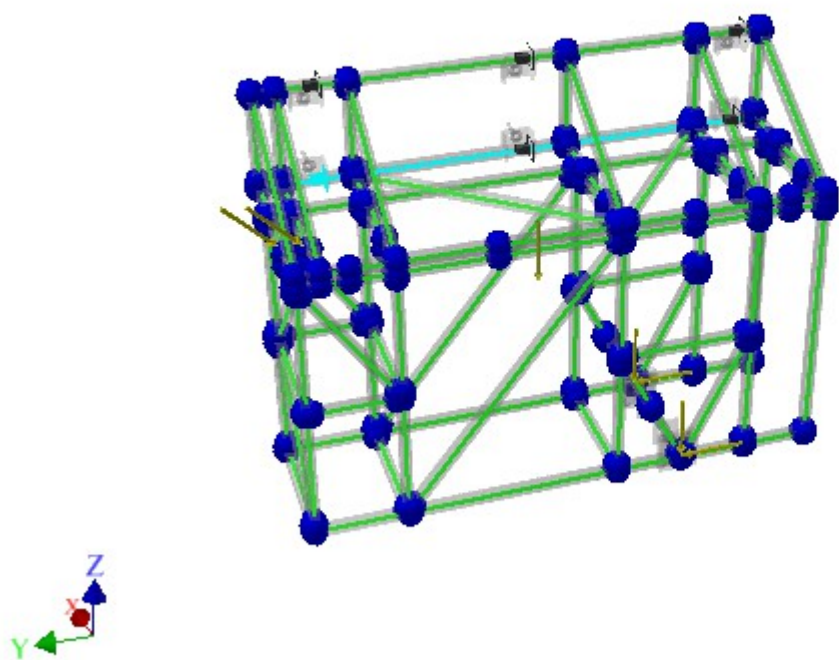
Selected Reference(s)



Fixed Constraint:4

Constraint Type	Fixed
Offset	180.000 mm

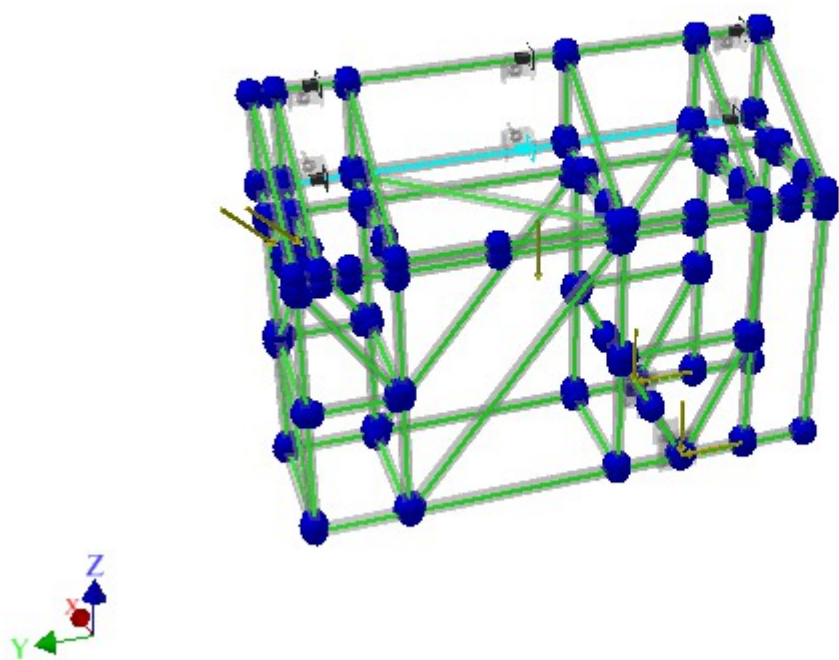
Selected Reference(s)



Fixed Constraint:5

Constraint Type	Fixed
Offset	930.000 mm

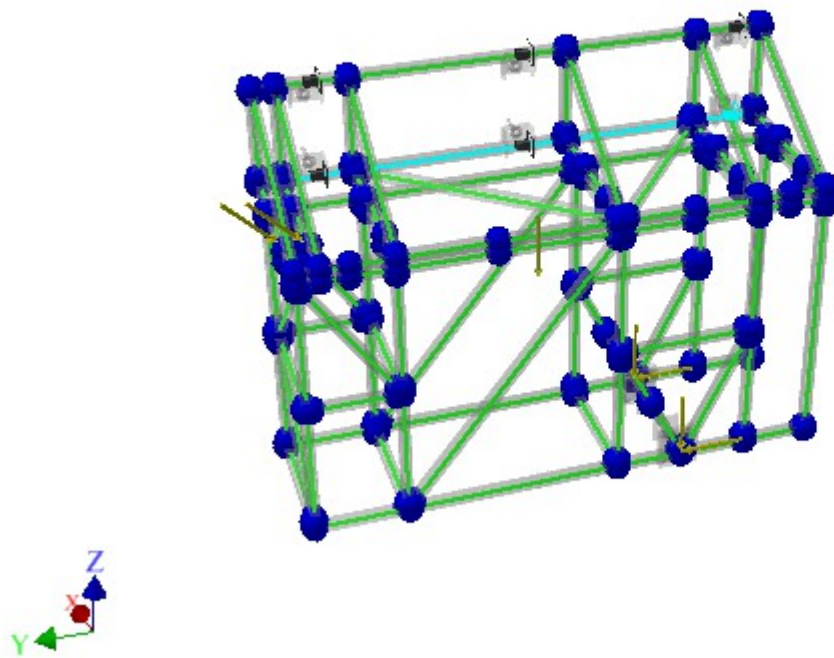
Selected Reference(s)



Fixed Constraint:6

Constraint Type	Fixed
Offset	1745.000 mm

Selected Reference(s)



Results

Reaction Force and Moment on Constraints

Constraint Name	Reaction Force		Reaction Moment	
	Magnitude	Components (Fx,Fy,Fz)	Magnitude	Components (Mx,My,Mz)

Fixed Constraint:1	4042.893 N	3533.214 N	53636.197 N mm	32994.526 N mm
		-20.820 N		24117.003 N mm
		1964.929 N		-34735.760 N mm
Fixed Constraint:2	1522.765 N	1248.753 N	142803.124 N mm	-75931.027 N mm
		226.908 N		12546.059 N mm
		841.393 N		120290.514 N mm
Fixed Constraint:3	3445.751 N	3013.496 N	56735.943 N mm	17463.582 N mm
		-152.683 N		18048.142 N mm
		1663.950 N		-50874.896 N mm
Fixed Constraint:4	3360.185 N	-2982.978 N	68757.562 N mm	12019.499 N mm
		757.829 N		51141.570 N mm
		1348.475 N		44358.469 N mm
Fixed Constraint:5	1079.475 N	-749.898 N	101574.672 N mm	-70367.654 N mm
		-57.394 N		38169.030 N mm
		774.356 N		-62521.456 N mm
Fixed Constraint:6	4414.641 N	-4062.589 N	86562.732 N mm	31239.919 N mm
		428.140 N		70198.506 N mm
		1673.656 N		39866.576 N mm

Reactions		Reactions	
Fixed Constraint:1		Fixed Constraint:4	
Fx	1964.929 N	Fx	-2982.978 N
Fy	-3533.214 N	Fy	1348.475 N
Fz	20.820 N	Fz	-757.829 N
Mx	-34735.760 N mm	Mx	12019.499 N mm
My	-32994.526 N mm	My	44358.469 N mm
Mz	-24117.003 N mm	Mz	-51141.570 N mm
Reactions		Reactions	
Fixed Constraint:2		Fixed Constraint:5	
Fx	841.393 N	Fx	-749.898 N
Fy	-1248.753 N	Fy	774.356 N
Fz	-226.908 N	Fz	57.394 N
Mx	120290.514 N mm	Mx	-70367.654 N mm
My	75931.027 N mm	My	-62521.456 N mm
Mz	-12546.059 N mm	Mz	-38169.030 N mm
Reactions		Reactions	
Fixed Constraint:3		Fixed Constraint:6	
Fx	1663.950 N	Fx	-4062.589 N
Fy	-3013.496 N	Fy	1673.656 N
Fz	152.683 N	Fz	-428.140 N
Mx	-50874.896 N mm	Mx	31239.919 N mm
My	-17463.582 N mm	My	39866.576 N mm
Mz	-18048.142 N mm	Mz	-70198.506 N mm
Results		Results	
Length	1865.000 mm	Length	1865.000 mm
Fx _{max}	-1168.610 N	Fx _{max}	2287.960 N
Fy _{max}	1975.078 N	Fy _{max}	-990.500 N
Fz _{max}	-283.964 N	Fz _{max}	877.757 N
Mx _{max}	135943.503 N mm	Mx _{max}	-77133.041 N mm
My _{max}	80908.941 N mm	My _{max}	-125926.415 N mm
Mz _{max}	12109.994 N mm	Mz _{max}	40737.353 N mm
S _{max,max}	63.152 MPa	S _{max,max}	47.958 MPa
S _{min,min}	-61.831 MPa	S _{min,min}	-51.114 MPa
S _{max(Mx),max}	39.176 MPa	S _{max(Mx),max}	22.228 MPa
S _{max(My),max}	23.316 MPa	S _{max(My),max}	36.289 MPa
S _{min(Mx),min}	-39.176 MPa	S _{min(Mx),min}	-22.228 MPa
S _{min(My),min}	-23.316 MPa	S _{min(My),min}	-36.289 MPa
S _{axial,max}	0.967 MPa	S _{axial,max}	-2.989 MPa
Tx _{max}	8.701 MPa	Tx _{max}	-17.035 MPa
Ty _{max}	-14.705 MPa	Ty _{max}	7.375 MPa
T _{max}	-2.315 MPa	T _{max}	-7.789 MPa

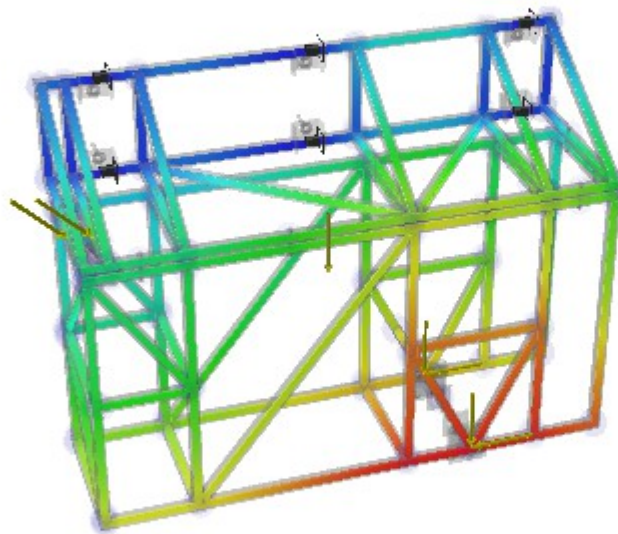
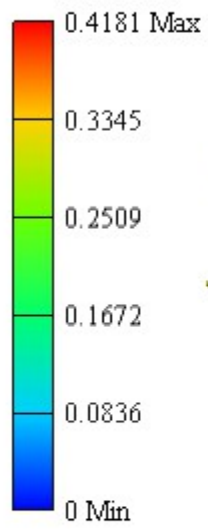
Static Result Summary

Name		Minimum	Maximum
Displacement		0.000 mm	0.418 mm
Forces	Fx	-1774.629 N	2287.960 N
	Fy	-1562.534 N	1975.078 N
	Fz	-2153.054 N	2585.073 N
Moments	Mx	-82072.892 N mm	135943.503 N mm
	My	-125926.415 N mm	81063.583 N mm
	Mz	-32943.238 N mm	40737.353 N mm
Normal Stresses	Smax	-4.338 MPa	63.152 MPa
	Smin	-61.831 MPa	6.841 MPa
	Smax(Mx)	0.000 MPa	39.176 MPa
	Smin(Mx)	-39.176 MPa	0.000 MPa
	Smax(My)	0.000 MPa	36.289 MPa
	Smin(My)	-36.289 MPa	0.000 MPa
	Saxial	-8.802 MPa	7.331 MPa
Shear Stresses	Tx	-17.035 MPa	13.213 MPa
	Ty	-14.705 MPa	11.634 MPa
Torsional Stresses	T	-7.789 MPa	6.299 MPa

Figures

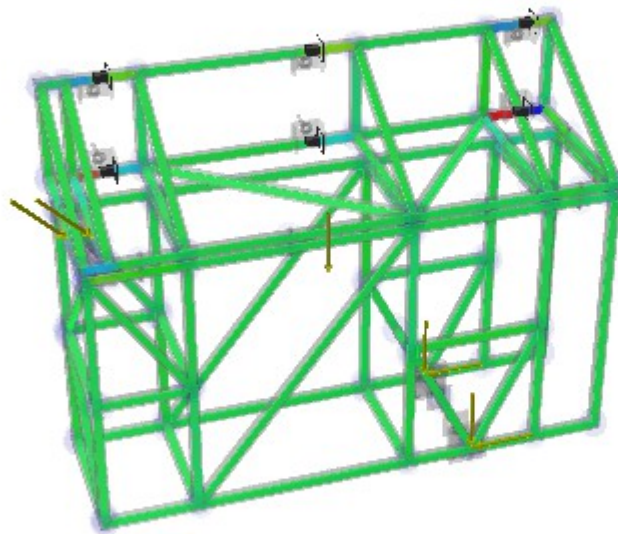
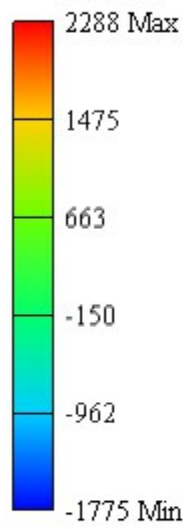
Displacement

Type: Displacement
Units: mm
1/28/2017, 7:36:48 PM



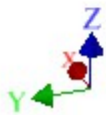
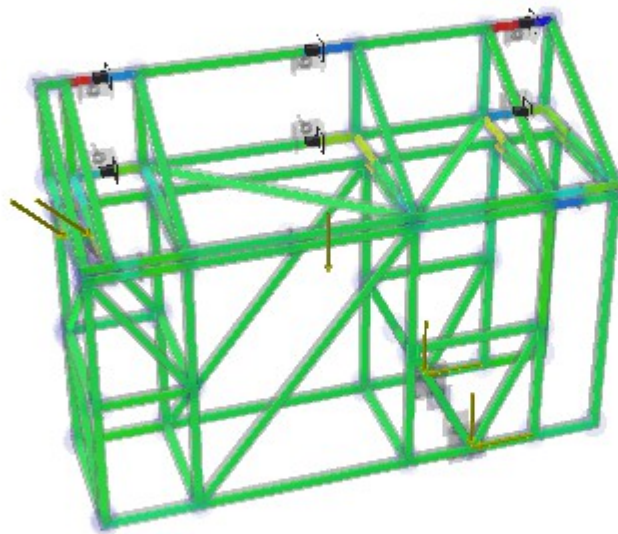
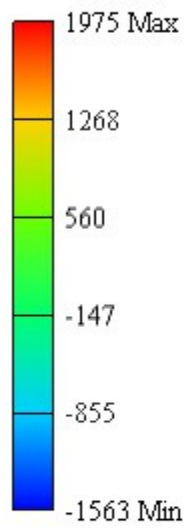
Fx

Type: Force Fx
Units: N
1/28/2017, 7:36:48 PM



Fy

Type: Force Fy
Units: N
1/28/2017, 7:36:49 PM

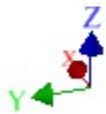
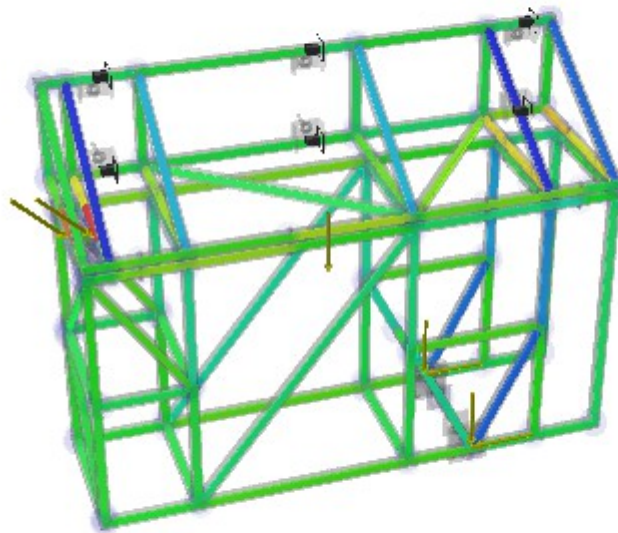
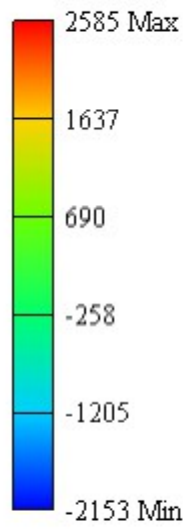


Fz

Type: Force Fz

Units: N

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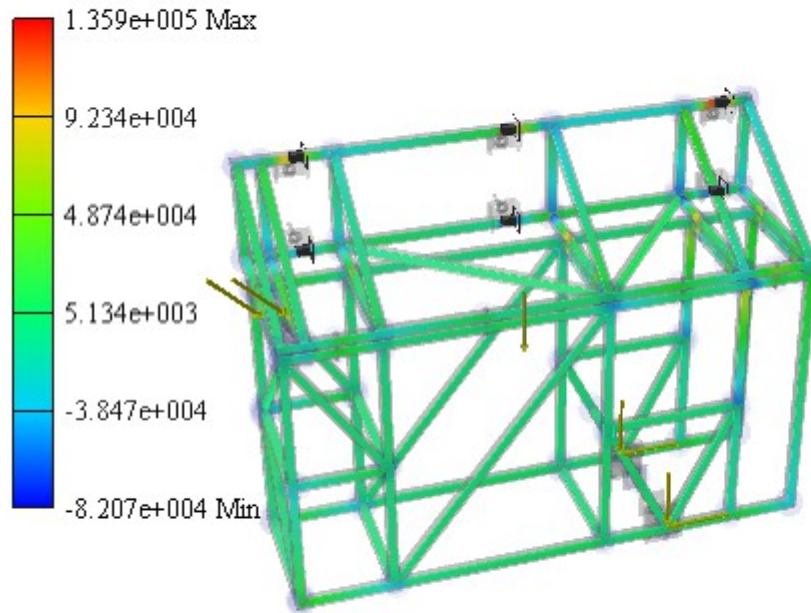


Mx

Type: Moment Mx

Units: N mm

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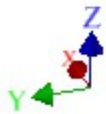
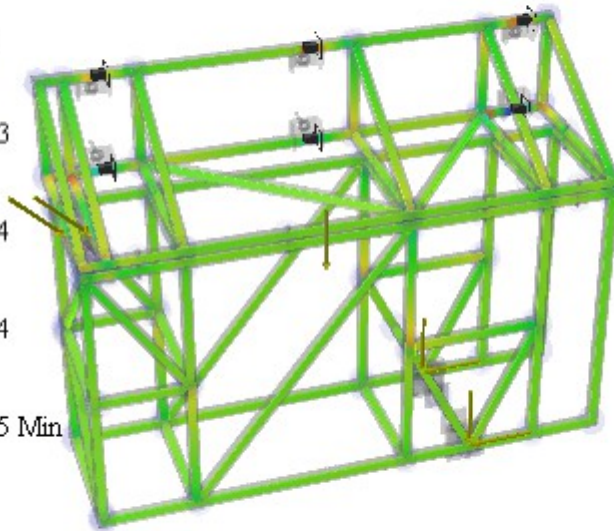
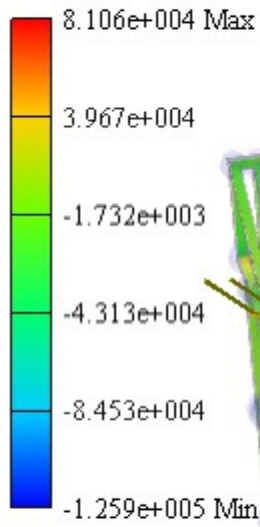


My

Type: Moment My

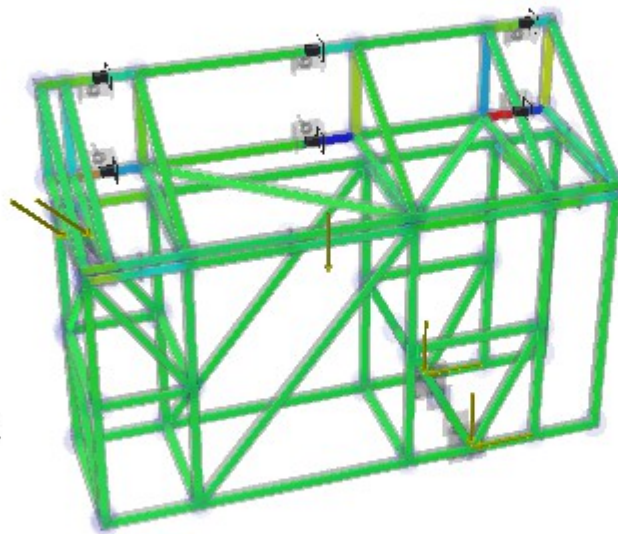
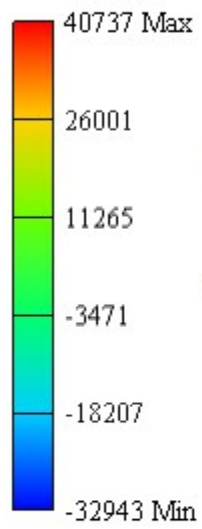
Units: N mm

1/28/2017, 7:36:49 PM



Mz

Type: Moment Mz
Units: N mm
1/28/2017, 7:36:49 PM

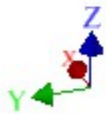
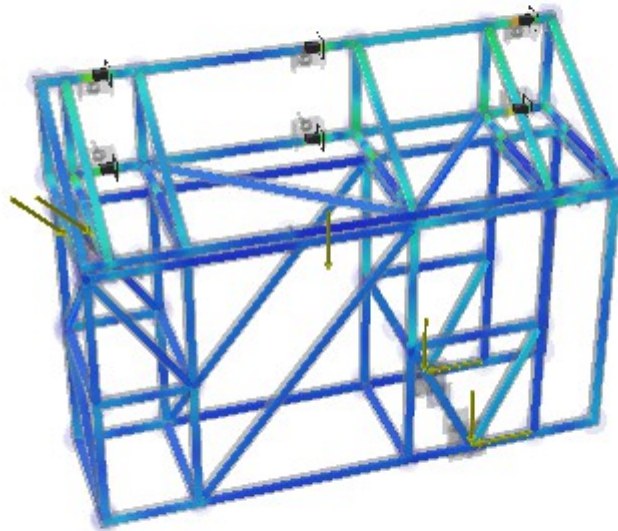
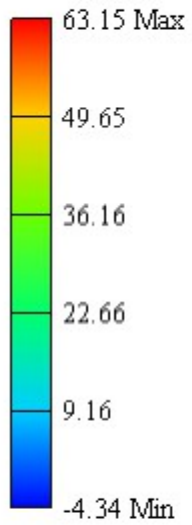


Smax

Type: Normal Stress Smax

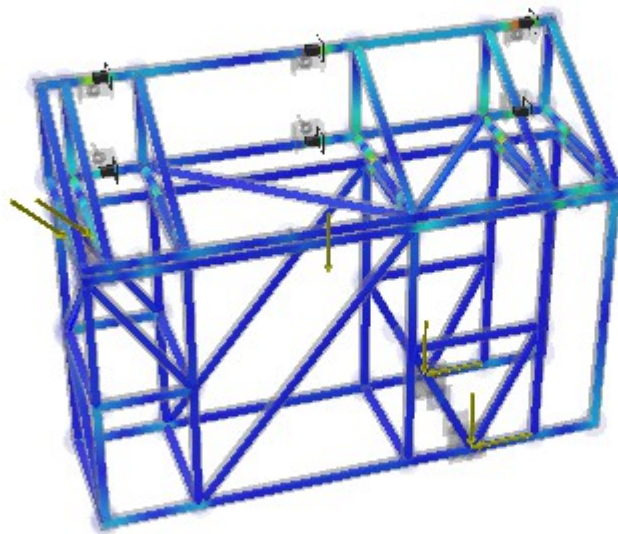
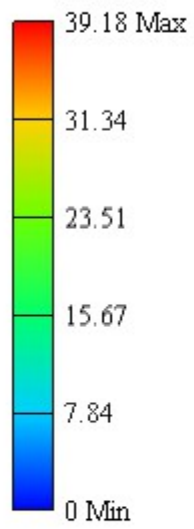
Units: MPa

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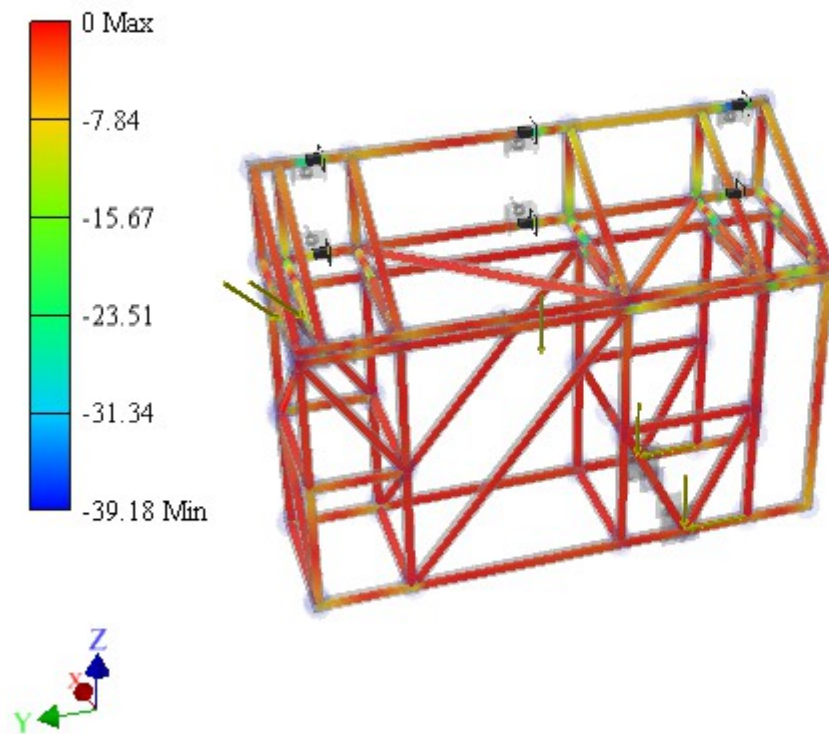
Smax(Mx)

Type: Bending Stress (Mx) max
Units: MPa
1/28/2017, 7:36:49 PM



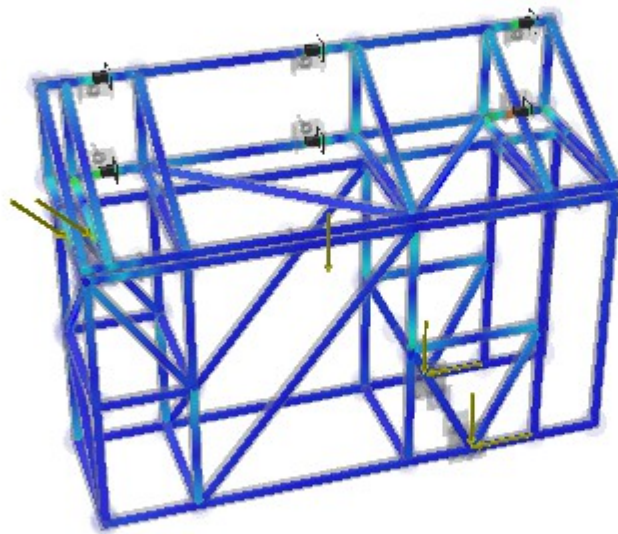
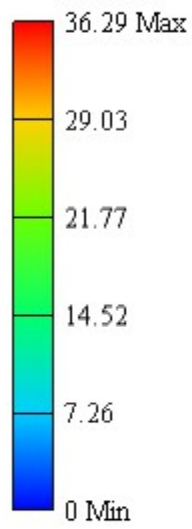
Smin(Mx)

Type: Bending Stress (Mx) min
Units: MPa
1/28/2017, 7:36:50 PM



Smax(My)

Type: Bending Stress (My) max
Units: MPa
1/28/2017, 7:36:49 PM

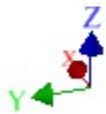
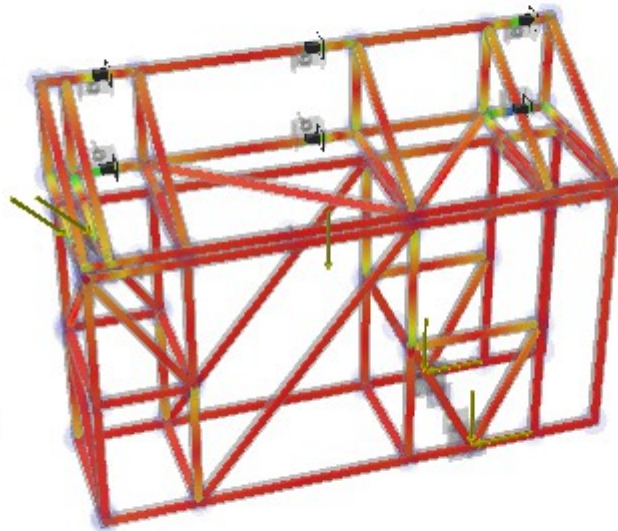
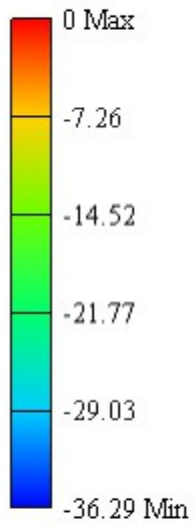


Smin(My)

Type: Bending Stress (My) min

Units: MPa

1/28/2017, 7:36:50 PM

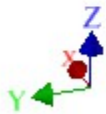
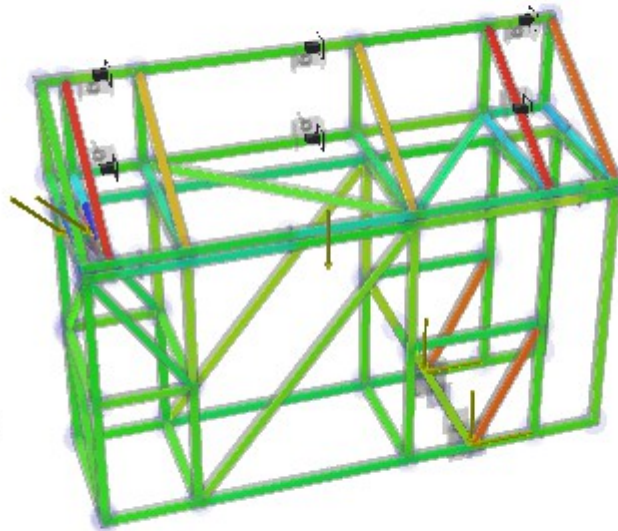
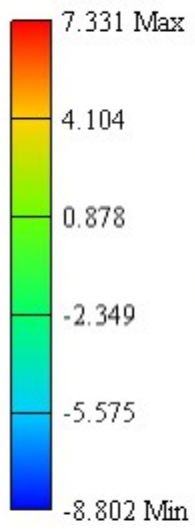


Saxial

Type: Axial Stress Saxial

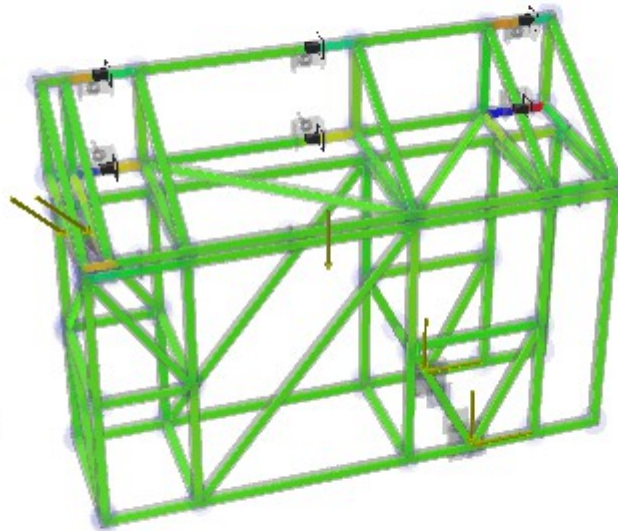
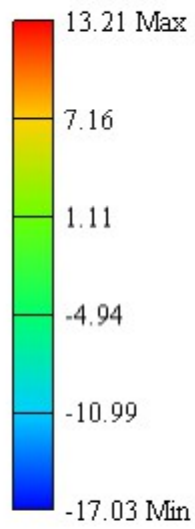
Units: MPa

1/28/2017, 7:36:50 PM



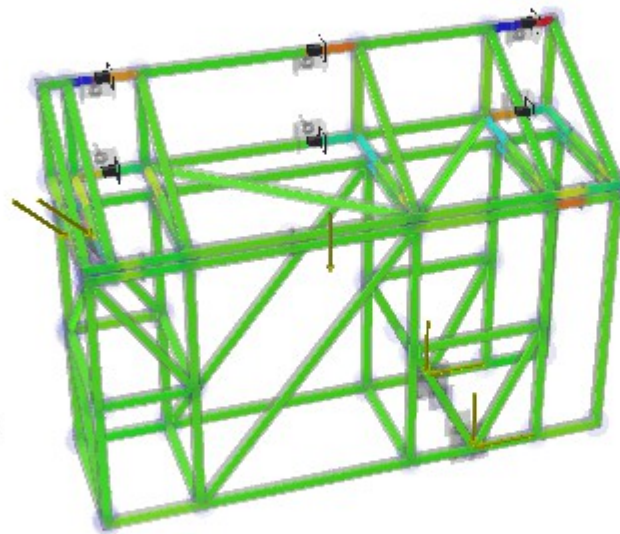
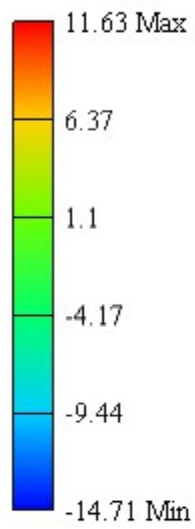
Tx

Type: Shear Stress Tx
Units: MPa
1/28/2017, 7:36:50 PM



Ty

Type: Shear Stress Ty
Units: MPa
1/28/2017, 7:36:50 PM



T

Type: Torsional Stress T

Units: MPa

1/28/2017, 7:36:50 PM

