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Simulation of CM Assembly

Date: Wednesday, November 04, 2015
Designer: Christopher Thauer
Study name: 40mph Wind Test
Analysis type: Static

Table of Contents

Description 1
Assumptions ..... **Error! Bookmark not defined.**
Model Information**Error! Bookmark not defined.**
Study Properties 2
Units 3
Material Properties 3
Loads and Fixtures**Error! Bookmark not defined.**
Connector Definitions**Error! Bookmark not defin**
Contact Information**Error! Bookmark not define**
Resultant Forces 3
Study Results 4
Conclusion 5

Description

The simulation of the LM-30-8.75-5S-SM fully extended in a 40 mph wind load. The simulation was done in Solidworks first using flow simulation to simulate a wind load. The results were then imported into a static simulation. This is the result of that simulation.

Study Properties

Study name	40mph Wind Test
Analysis type	Static
Mesh type	Mixed Mesh
Thermal Effect:	On
Thermal option	Include temperature loads
Zero strain temperature	77 Fahrenheit
Include fluid pressure effects from SOLIDWORKS Flow Simulation	On
Solver type	Automatic
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

Units

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

Mesh information

Mesh type	Mixed Mesh
Mesher Used:	Curvature based mesh
Jacobian points	16 Points
Jacobian check for shell	On
Maximum element size	4.07336 in
Minimum element size	0.814671 in
Mesh Quality	High
Remesh failed parts with incompatible mesh	On

Resultant Forces

Reaction forces

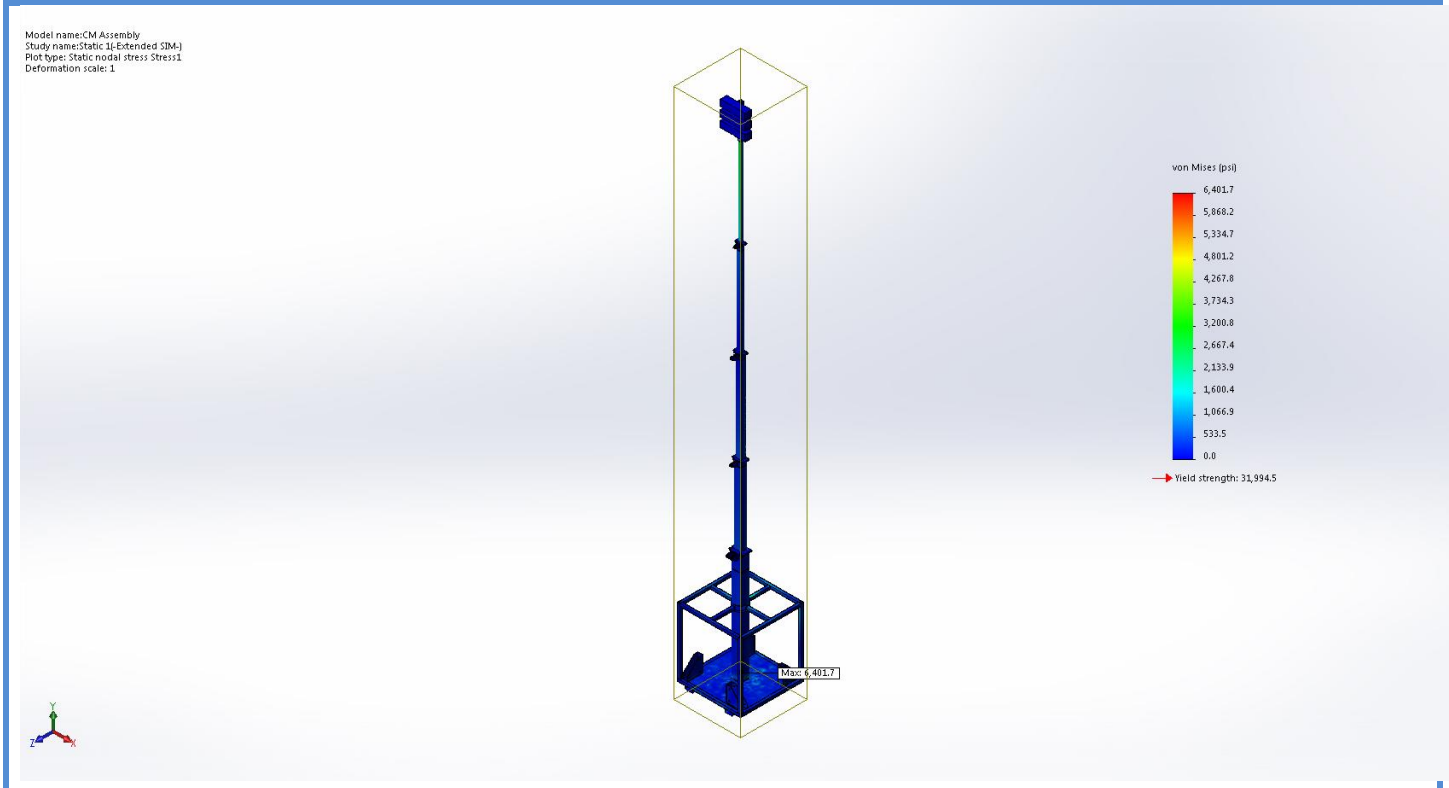
Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	lbf	4.61398	1120.12	57.2575	1121.6

Reaction Moments

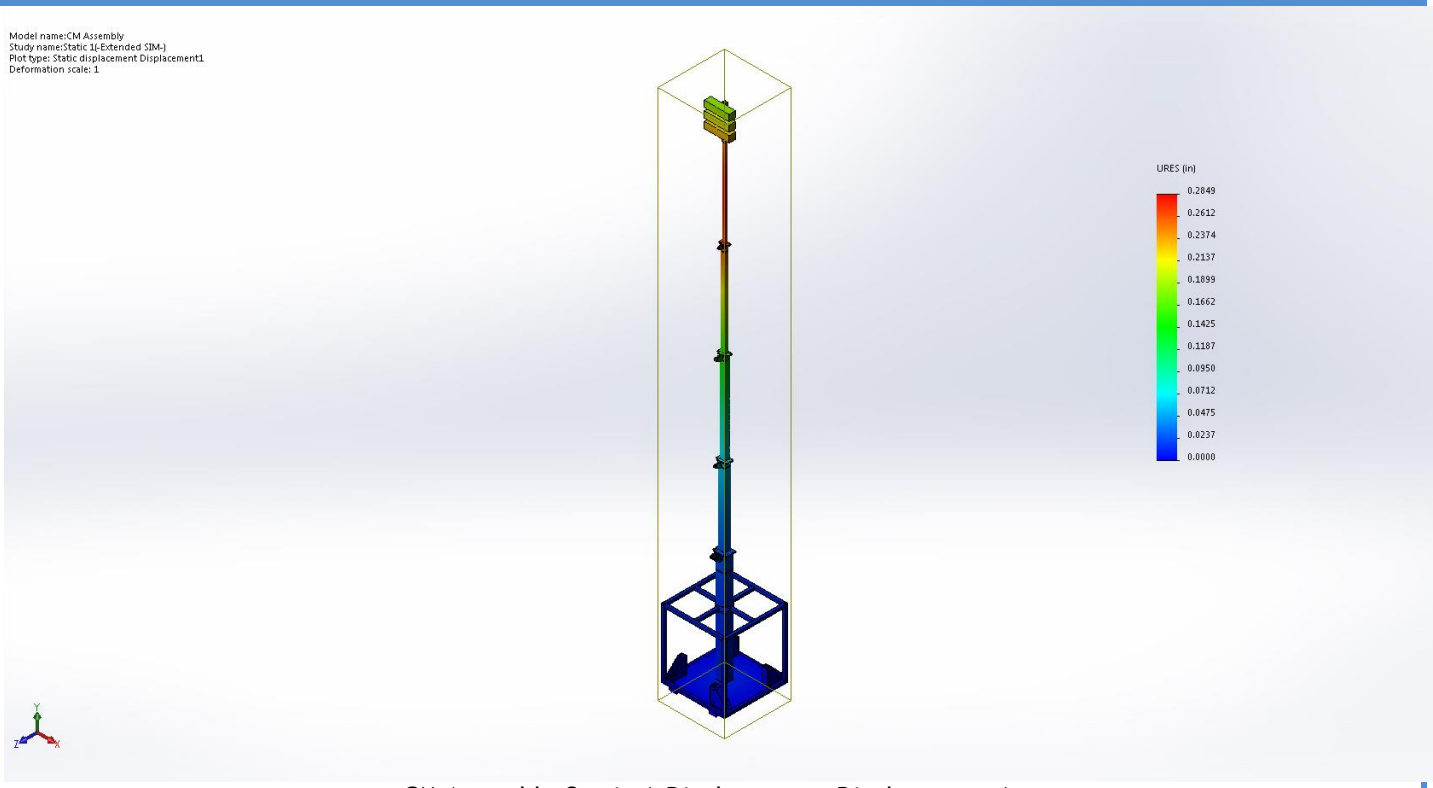
Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	lbf.in	-1.50624	-2.47836	-11.5874	11.9448

Study Results

Name	Type	Min	Max
Stress	VON: von Mises Stress	0 psi Node: 165	6401.66 psi Node: 35320



Name	Type	Min	Max
Displacement	URES: Resultant Displacement	0 in Node: 5	0.284902 in Node: 129406



CM Assembly-Static 1-Displacement-Displacement1

Name	Type	Min	Max
Strain	ESTRN: Equivalent Strain	0 Element: 454	0.000174744 Element: 22194

Conclusion

It can be concluded that the LM-30-8.75-5S-SM should be able to survive a wind load of 40 mph. The maximum stress was shown to be 6,401 psi. Assuming the yield strength of carbon steel to be 31,994 psi, this gives a Factor of safety of 4.99. The maximum displacement at the top of the light mast is shown to be 0.284".

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Simulation of CM Assembly

Date: Wednesday, November 04, 2015
Designer: Christopher Thauer
Study name: 105mph Wind Test
Analysis type: Static

Table of Contents

Description 1
Study Properties 2
Units 3
Mesh information 3
Resultant Forces 3
Study Results 4
Conclusion 5

Description

The simulation of the LM-30-8.75-5S-SM fully extended in a 105 mph wind load. The simulation was done in Solidworks first using flow simulation to simulate a wind load. The results were then imported into a static simulation. This is the result of that simulation.

Study Properties

Study name	105mph Wind Test
Analysis type	Static
Mesh type	Mixed Mesh
Thermal Effect:	On
Thermal option	Include temperature loads
Zero strain temperature	77 Fahrenheit
Include fluid pressure effects from SOLIDWORKS Flow Simulation	On
Solver type	Automatic
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

Units

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

Mesh information

Mesh type	Mixed Mesh
Mesher Used:	Curvature based mesh
Jacobian points	16 Points
Jacobian check for shell	On
Maximum element size	4.07336 in
Minimum element size	0.814671 in
Mesh Quality	High
Remesh failed parts with incompatible mesh	On

Resultant Forces

Reaction forces

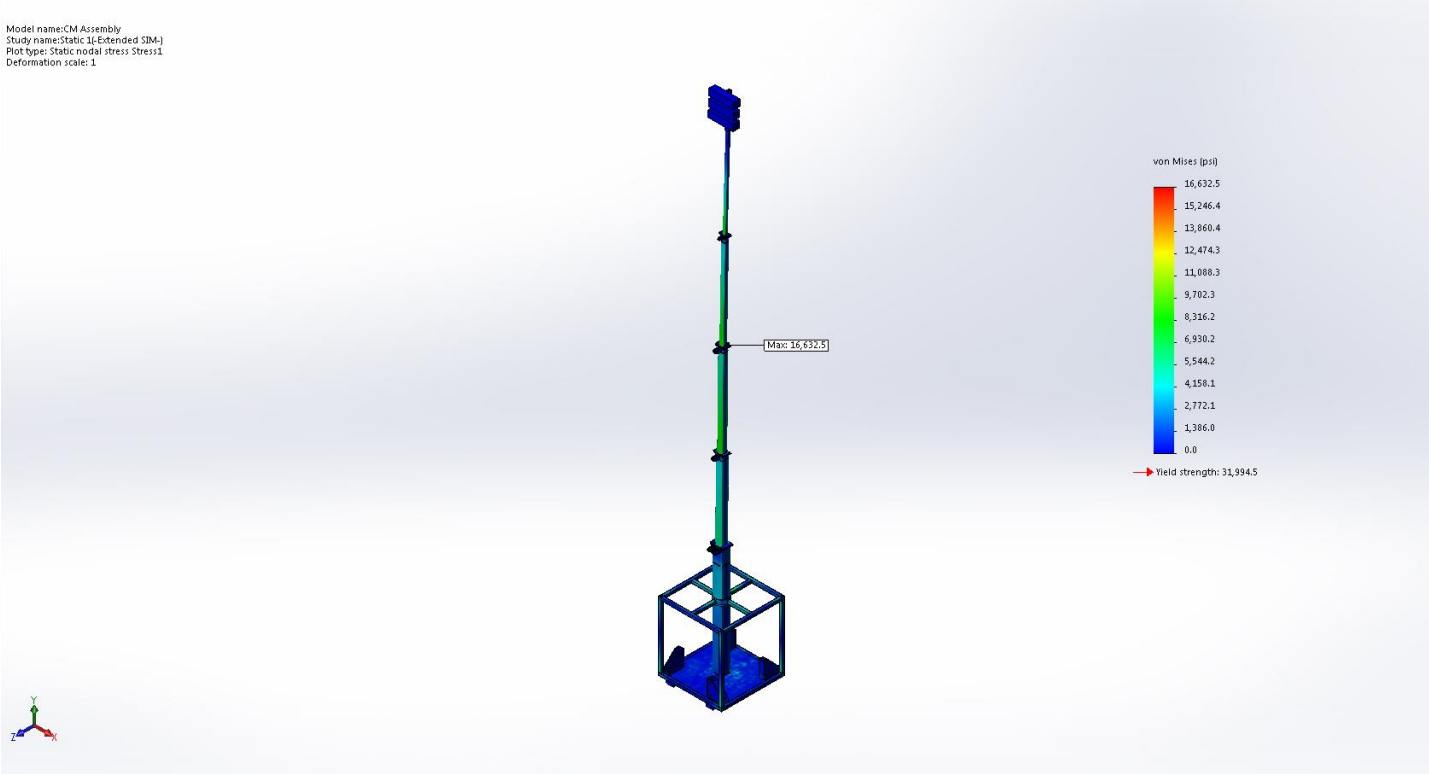
Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	lbf	-0.72747	1141.83	389.452	1206.42

Reaction Moments

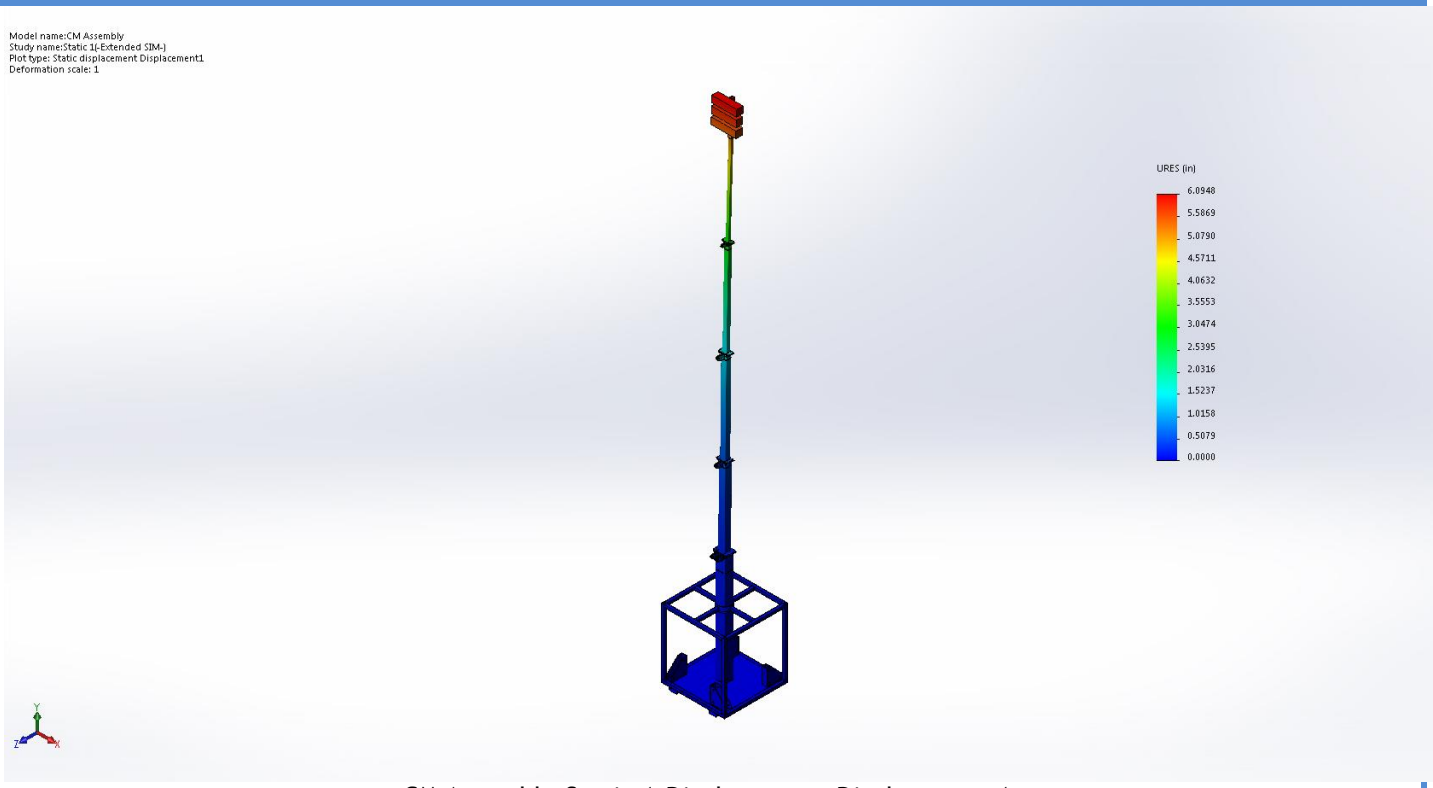
Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	lbf.in	-8.19869	-18.1581	71.7182	74.4341

Study Results

Name	Type	Min	Max
Stress	VON: von Mises Stress	0 psi Node: 165	16632.5 psi Node: 114785



Name	Type	Min	Max
Displacement	URES: Resultant Displacement	0 in Node: 5	6.09475 in Node: 10886



CM Assembly-Static 1-Displacement-Displacement1

Name	Type	Min	Max
Strain	ESTRN: Equivalent Strain	0 Element: 454	0.000428917 Element: 22130

Conclusion

It can be concluded that the LM-30-8.75-5S-SM should be able to survive a wind load of 105 mph. The maximum stress was shown to be 16,632 psi. Assuming the yield strength of carbon steel to be 31,994 psi, this gives a Factor of safety of 1.92. The maximum displacement at the top of the light mast is shown to be 6.09”.