Aberdeen Technical Services and General Transportation

Simulation Study for the proof load test of lifting frame

Iraq -Basra -AlBarjisia Main Road-ATS Yard

29-September-2023

Simulation of Bulk Bag Lifting Frame 6 t SWL

9.5t upper Pad eye and 3.25t Lower Pad eyes

Date: Friday, September 29, 2023
Designer: Eng. Hasan Omran
Study name: Proof load test Simulation study
Client: Great Wall Drilling Company
Relative standard: BE EN 13155:2020
Analysis type: Static

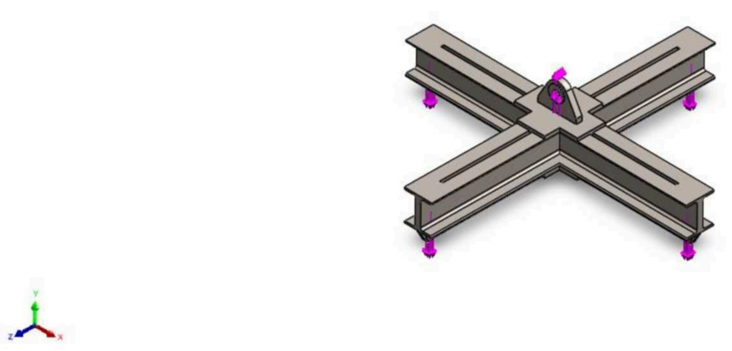
Table of Contents

Description:

6 t Lifting Frame:

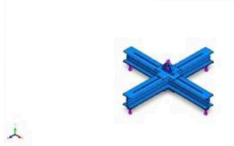
- 1 x 9.5 t upper pad eyes
- 4 x 3.25 t lower pad eyes
- UPN 160 Channels
- 1343.5 mm span (Distance between the centers of lower pad eyes).
- Dimensions: L: 1463.5 x W: 1463.5 x H: 392 [mm]
- Self-Weight: 153 Kg

Model Information



Model name: Bulk Bag Lifting Frame - 6t SWL
Current Configuration: Default

Solid Bodies

Document Name and Reference	Treated As	Volumetric Properties	Document Path/Date Modified
Mirror4 	Solid Body	Mass:153.097 kg Volume:0.0195027 m^3 Density:7,850 kg/m^3 Weight:1,500.35 N	D:\Hasan\Aberdeen\Solid Works Drawings\Solidworks Drawings\Solidworks Drawings\Bulk Bag Lifting Frame\Bulk Bag Lifting Frame.SLDPRT Sep 29 17:56:55 2023

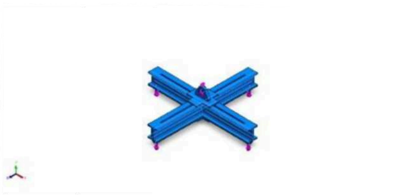
Study Properties

Study name	Proof Load Test - 9 t
Analysis type	Static
Mesh type	Solid Mesh
Thermal Effect:	On
Thermal option	Include temperature loads
Zero strain temperature	298 Kelvin
Include fluid pressure effects from SOLIDWORKS Flow Simulation	Off
Solver type	Automatic
Inplane Effect:	Off
Soft Spring:	On
Inertial Relief:	On
Incompatible bonding options	Automatic
Large displacement	Off
Compute free body forces	On
Friction	Off
Use Adaptive Method:	Off
Result folder	SOLIDWORKS document (D:\Hasan\Aberdeen\SolidWorks Drawings\Solidworks Drawings\Solidworks Drawings\Bulk Bag Lifting Frame)

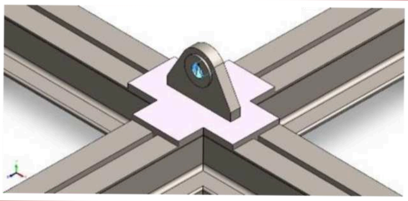
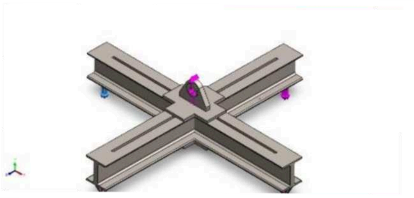
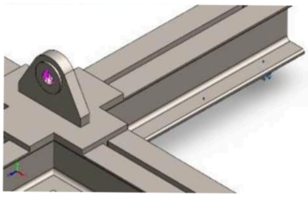
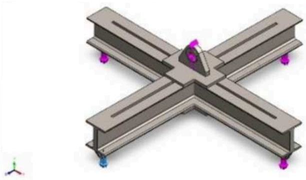
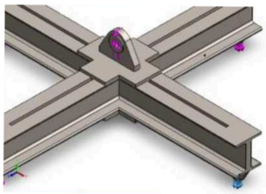
Units

Unit system:	SI (MKS)
Length/Displacement	mm
Temperature	Kelvin
Angular velocity	Rad/sec
Pressure/Stress	N/m^2

Material Properties

Model Reference	Properties	Components
	**Name:** ASTM A36 Steel **Model type:** Linear Elastic Isotropic **Default failure criterion:** Unknown **Yield strength:** 2.5e+08 N/m^2 **Tensile strength:** 4e+08 N/m^2 **Elastic modulus:** 2e+11 N/m^2 **Poisson's ratio:** 0.26 **Mass density:** 7,850 kg/m^3 **Shear modulus:** 7.93e+10 N/m^2	• UPN 160 Channels • 9.5 t Pad eye • 3.25 t Pad eyes • Stiffeners and reinforcement plates
Curve Data:N/A		

Loads and Fixtures

Load name	Load Image	Load Details
Force-1		**Entities:** 1 face(s) **Reference:** Face< 1 > **Type:** Apply force **Values:** 9,000 kgf
Force-2		**Entities:** 1 face(s) **Reference:** Face< 1 > **Type:** Apply force **Values:** 2,250 kgf
Force-3		**Entities:** 1 face(s) **Reference:** Face< 1 > **Type:** Apply force **Values:** 2,250 kgf
Force-4		**Entities:** 1 face(s) **Reference:** Face< 1 > **Type:** Apply force **Values:** -2,250 kgf
Force-5		**Entities:** 1 face(s) **Reference:** Face< 1 > **Type:** Apply force **Values:** -2,250 kgf

Mesh information

Mesh type	Solid Mesh
Mesher Used:	Curvature-based mesh
Jacobian points for High quality mesh	16 Points
Maximum element size	34.5114 mm
Minimum element size	6.90229 mm
Mesh Quality	High

Mesh information - Details

Total Nodes	197825
Total Elements	109701
Maximum Aspect Ratio	37.465
% of elements with Aspect Ratio < 3	86.3
Percentage of elements with Aspect Ratio > 10	0.191
Percentage of distorted elements	0
Time to complete mesh(hh;mm;ss):	00:00:10
Computer name:	

Resultant Forces

Reaction forces

Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	N	0	0	0	1e-33

Reaction Moments

Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	N.m	0	0	0	0

Free body forces

Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	N	-0.0614997	-0.0384802	0.0423678	0.0840117

Free body moments

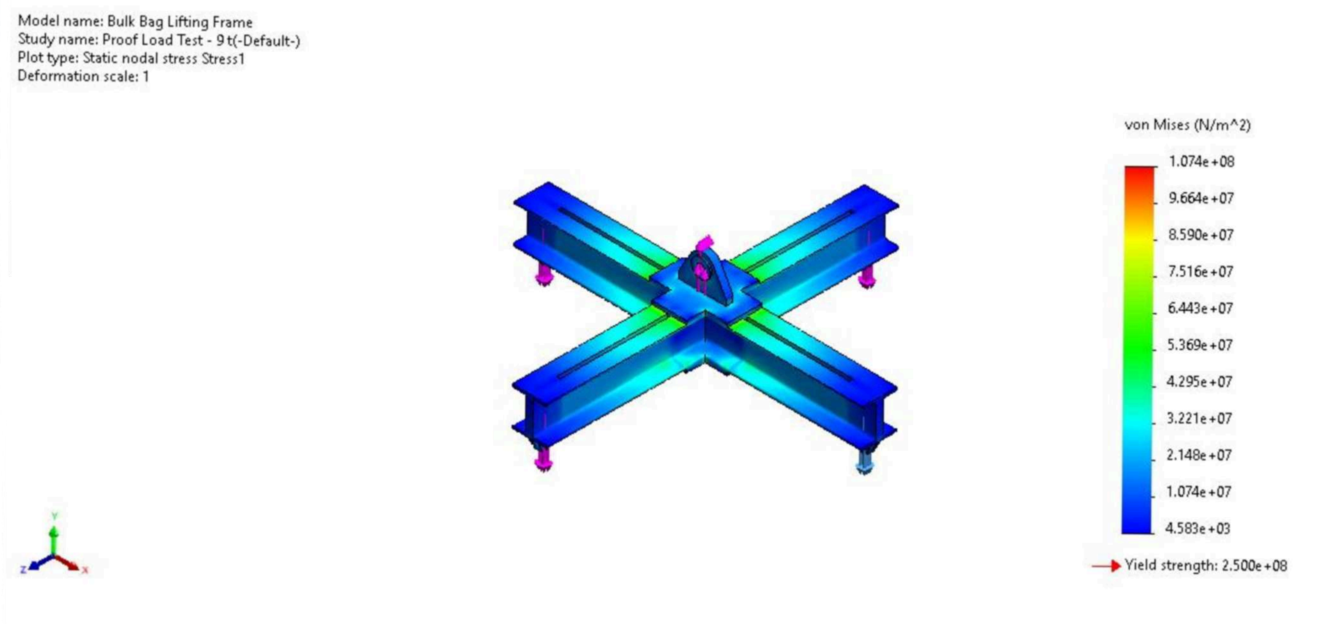
Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	N.m	0	0	0	1e-33

Beams

No Data

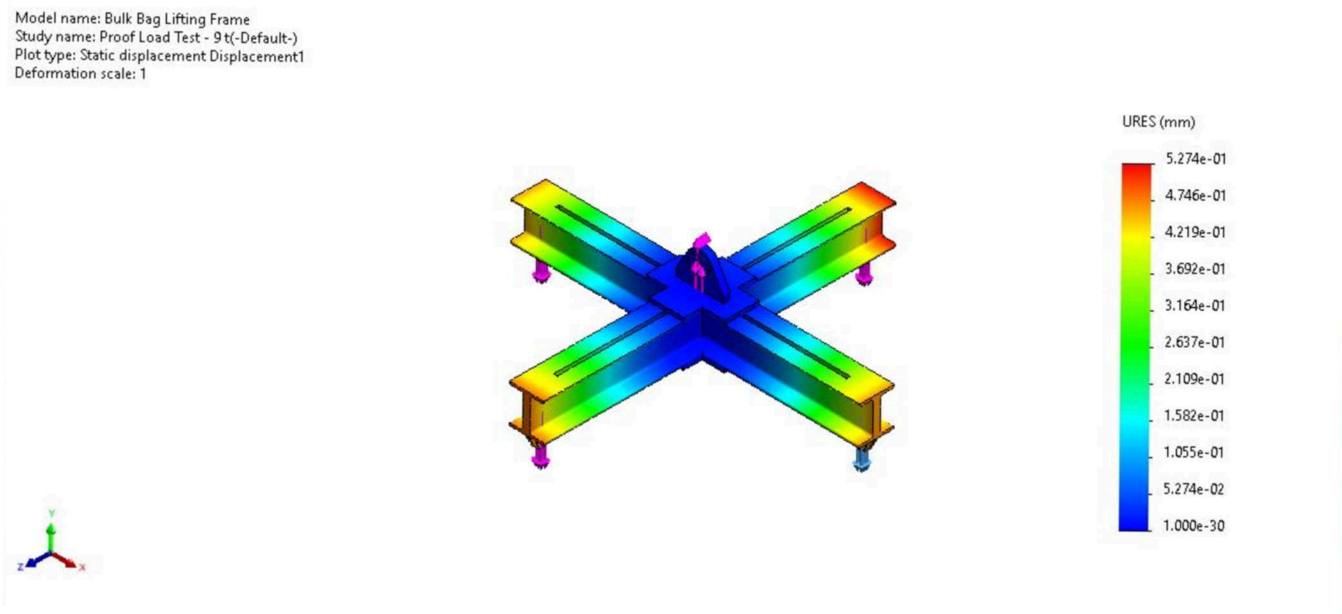
Study Results

Name	Type	Min	Max
Stress1	VON: von Mises Stress	4.583e+03N/m^2 Node: 151	1.074e+08N/m^2 Node: 35412



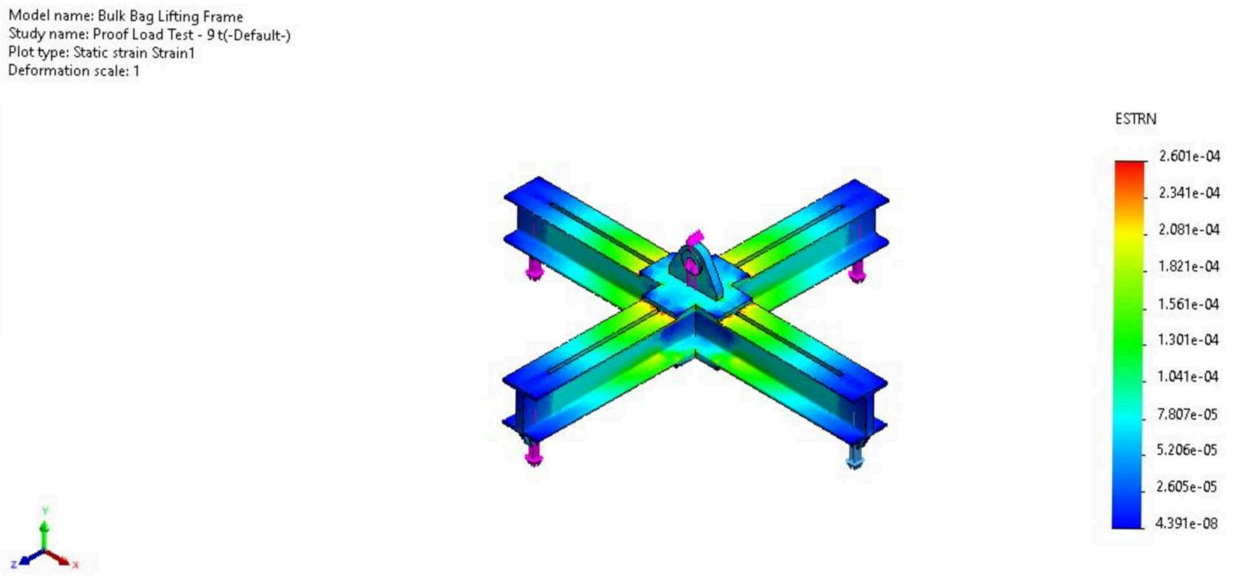
Bulk Bag Lifting Frame-Proof Load Test - 9 t-Stress-Stress1

Name	Type	Min	Max
Displacement1	URES: Resultant Displacement	0.000e+00mm Node: 26357	5.274e-01mm Node: 33592



Bulk Bag Lifting Frame-Proof Load Test - 9 t-Displacement-Displacement1

Name	Type	Min	Max
Strain1	ESTRN: Equivalent Strain	4.391e-08 Element: 24151	2.601e-04 Element: 16844



Bulk Bag Lifting Frame-Proof Load Test - 9 t-Strain-Strain1

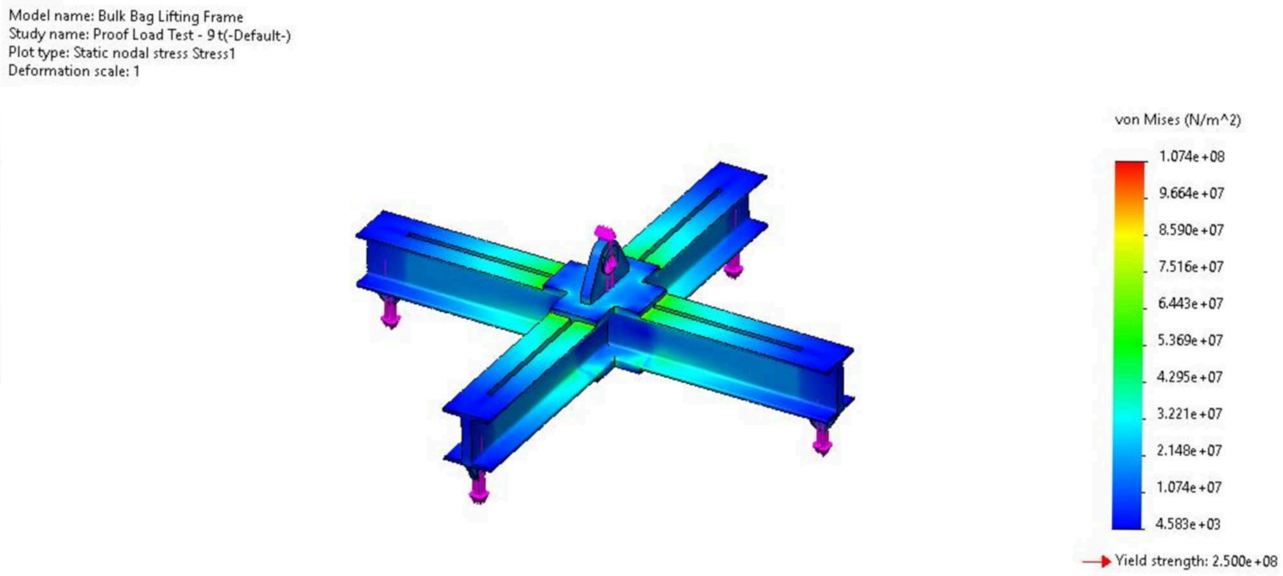
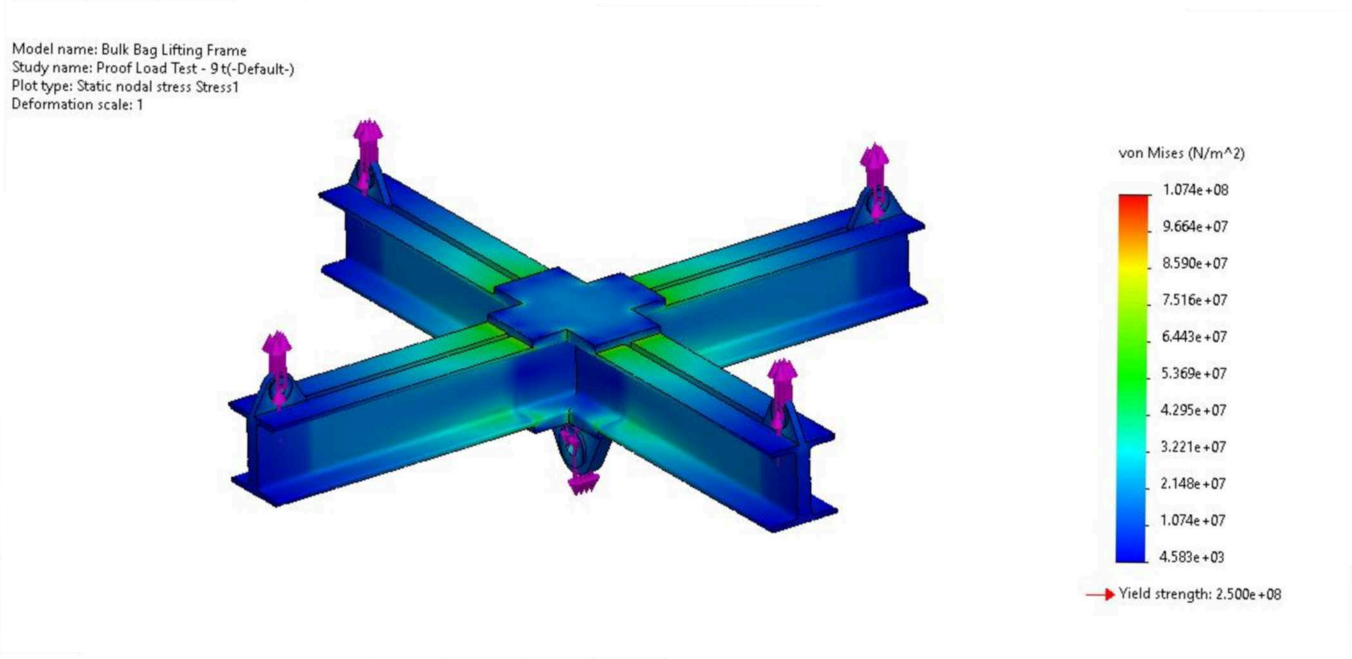


Image-1



Model name: Bulk Bag Lifting Frame
Study name: Proof Load Test - 9 t(-Default-)
Plot type: Static nodal stress Stress1
Deformation scale: 1
von Mises (N/m^2)
1.074e+08
9.664e+07
8.590e+07
7.516e+07
6.443e+07
5.369e+07
4.295e+07
3.221e+07
2.148e+07
1.074e+07
4.583e+03
Yield strength: 2.500e+08

Image-2

Conclusion:

By referring to the simulation results included in this study, we can find that the maximum stress induced during the proof load test is [1.074e+08 N/mm^2] (MPa) at the node No. 35412.

The maximum induced street is less than the yield strength of the construction material (ASTM A36) which is equal to [2.5e+08 N/m^2] (MPa) and this is the permanent deformation point where any stress above it will cause distortion in the attachment.

----------------------------- The studied attachment has been passed the simulation ---------------------

----------------------------- Ready for Fabrication ---------------------

Designer: Eng. Hasan Omran

Date: 29-09-2023

Signature:

Aberdeen Technical Services

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