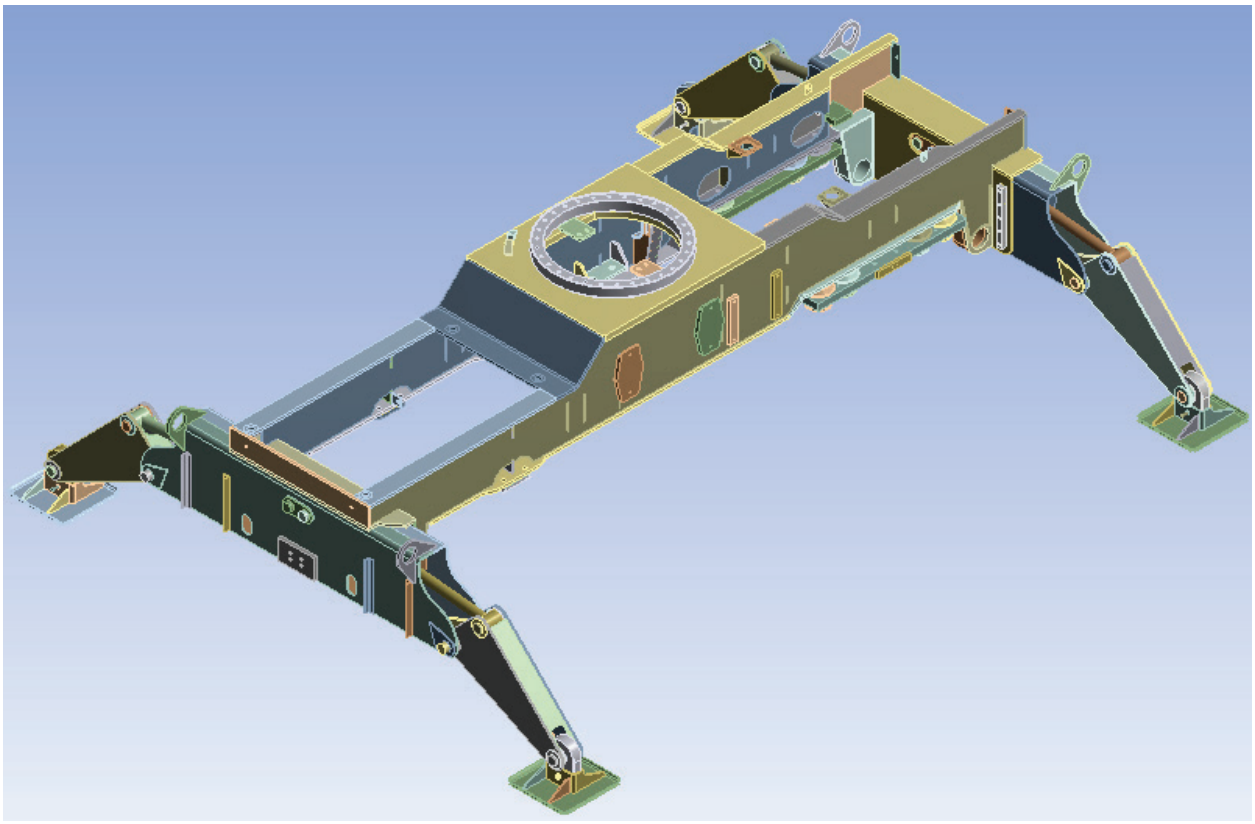

Rough Terrain Crain

FEA Report

Although Finite Element Analysis (FEA) has become a widely used tool for engineering analysis and design, it cannot be viewed as a complete substitute for testing. If reasonable doubt is present after performing engineering hand calculations and developing FEA models, controlled testing should be performed with reasonable loads and boundary conditions applied.

Project Title:	Carrier & Upper Structure FEA
FEA Model Name:	300-0007_FEA.SLDASM
Prepared By:	
Client Name:	
Date:	February 22, 2013

Executive Summary

In an effort to prove the structural integrity of the CD4415, a Finite Element Analysis (FEA) was conducted by Specialty Systems in 27 load scenarios of the carrier, 4 load scenarios of the upper structure, and 1 load scenario as a result of real world manufacturing.

The CD4415 carrier is primarily made from Domex® (for plate thicknesses less than 3/8in) and T1™ (for plate thickness greater than 3/8in) possessing yield strengths of 100,000psi (100ksi) and 110,000psi (110ksi) respectively.

Concerning the Carrier:
In some load scenarios considered, particularly those where the boom orientations are off to the side of the carrier, small areas of stress concentrations exist. However, these areas of stress concentration do not surpass the design criteria where the material must withstand at least a safety factor of 1.5 against material yielding. Later, however, it will be found that this conclusion is based upon a theoretically perfect CAD model where real world material effects from welding/cutting cannot accurately be predicted.

Concerning the Upper Structure:
The load cases analyzing the upper structure pass the design criteria of a 1.5 safety factor. The highest areas of stress concentrations exist at the support gusset just above the main lift cylinder, but stress values do not exceed the limit of 66,667psi.

Concerning Bolt Shearing between the Carrier and Outriggers:
An additional load scenario was created after a prototype had been built due to the shearing of bolts holding the carrier to the outrigger assembly. The rear outrigger plate (P/N 300-0278) had warped in welding and when the assemblies were joined this plate did not sit flush on the outrigger housing causing an unforeseen shearing load on the bolts. As a result of making the corresponding changes to the FEA model, the results concluded that this new induced shearing load was in fact greater than the allowable shear load of the bolts.

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