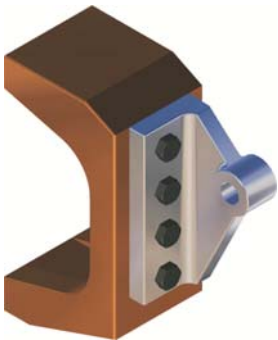


# ANALYSING A BOLTED CONNECTION

This is an example of one of the most difficult and yet most common problems to analyse.

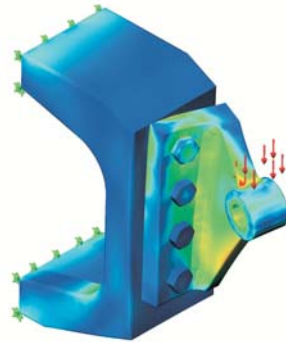
We are able to simulate bolted connections to determine true load distributions through the individual bolts.



The model shown is an offset bracket with four bolts spaced equidistance. This is attached to a substantial structure. The

model was first created in a 3D modeling package, using multiple parts.

The model was then transferred to the FEA (Finite Element Analysis) package.



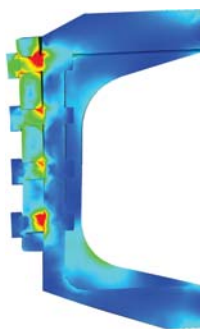
A vertical load was applied as shown with red arrows. The rear of the structure was

restrained as shown by the green arrows.

The FEA software simulates the surface contact that is encountered in real life. Objects can move away from specific faces but can't move through them. This type of analysis is called a Gap/Contact problem.

Once these constraints have been applied the model is analysed.

This model highlights high stressed areas as colours approach red. It also illustrates the effect of relative stiffness and what effect it has on the components. These results cannot be achieved easily using hand calculations.



Section views are also possible, which can show explicitly deformation characteristics

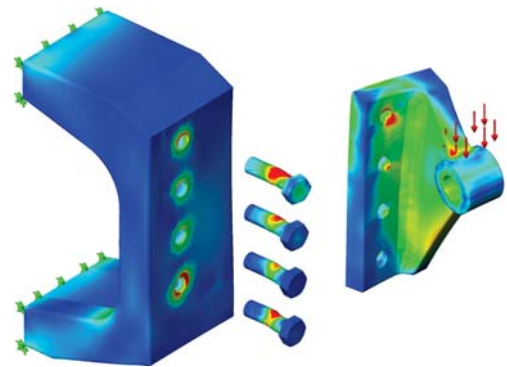
It is also possible to disassemble models to see what is

happening to individual components.

TSV are consulting mechanical engineers providing a wide range of engineering design and analytical services, ranging from specialised rollover protective structures to process engineering solutions.



This shows the true mode of strain for the given bolt in the pattern. In this model the top bolt shows that tensile stress is the main stress component, while the bottom bolt show that shear stress is the main stress component.



## BUDGET

Results like these can be achieved for less than \$1,000.

## BENEFITS FOR CLIENT

This process can answer questions for unexplained failures, without spending large amounts of money in a lab.

Various design solutions can be tested quickly without physically building and testing them to destruction, which would also require tests to be controlled in a lab environment to compare results.

## Computer aided design and engineering

TSV brings to bear the powerful combination of AutoCad, 3D solid modelling and Finite Element Analysis (FEA). FEA saves time and money, reduces risk, and optimises performance of parts and assemblies. Prototyping is minimised, materials and weight are optimised, performance is predicted. Rapid analysis and revision turns days of hand calculation into hours, hours into minutes - and all with vastly greater accuracy.