

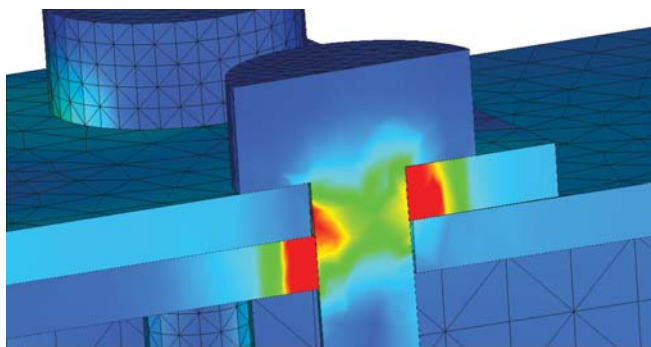
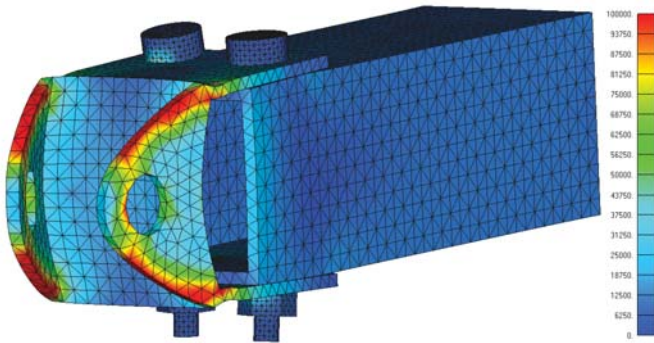
NEi Nastran Linear Contact

Application of Linear Contact in Industry

Surface contact has always been inherently nonlinear. For years, NEi Nastran has had the ability to use contact in a linear static solution for welding parts together. Now, in addition to the weld element, true nonlinear contact is available in a linear static solution, referred to as linear contact. Linear contact is designed for applications where materials stay linear and movement is small. Typical examples would be bolted connections and bearings often found in medical, defense, or heavy industry.

Benefits of Linear Contact

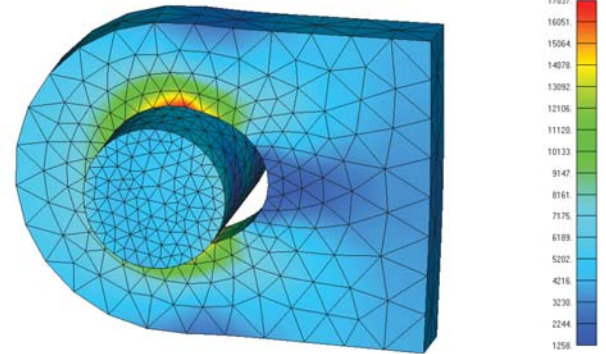
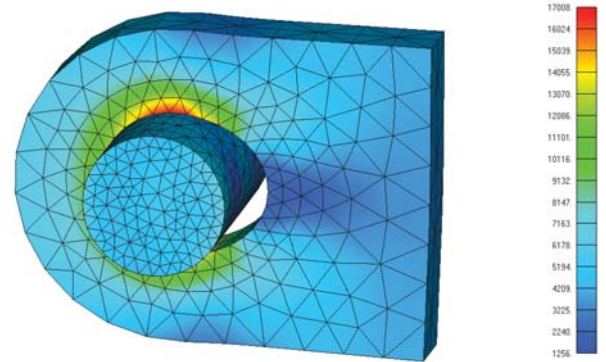
- **Significant time savings** – A linear contact analysis can be 2 - 10 times faster than a nonlinear contact analysis
- **Significant Cost savings** – No need to purchase a nonlinear solver if contact is all you need
- **Easy to setup and use** – Automated contact definition is supported
- **More robust** – Ability to run models which may have trouble converging in a fully nonlinear analysis



An ideal linear contact application, the trailer hitch above contains many contact surfaces which slide, load, and unload.

How it Works

- The user defines contact the same for either linear or nonlinear analysis
- Linear contact is on by default
- The solver automatically determines which contact elements are in tension and adjusts the contact stiffness
- The solution iterates until convergence when there are no further changes in element contact status
- The solver uses the converged contact state to continue the analysis and determine the final results

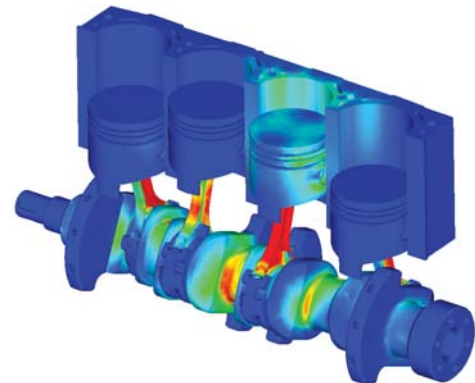


Comparison of linear contact (top) to nonlinear contact (bottom). The linear contact peak von Mises stress is 17,008 psi which compares well with the nonlinear result of 17,037 psi.

The Nonlinear Solver

Linear contact is not well suited for contact models with large deformations or large amounts of sliding. Models that are significantly nonlinear can be analyzed using dedicated nonlinear solvers which feature:

- Nonlinear Materials (nonlinear elastic, plastic, thermal elastic, hyperelastic, concrete, etc.)
- Large displacements and rotations
- Sliding contact
- Loads which follow deformed geometry
- Elements with load dependent stiffness such as cables and tension-only shells
- Buckling



An ideal application for nonlinear contact performed using a nonlinear transient response solution. The pistons of the engine undergo large displacements and sliding over several elements. The crankshaft undergoes large rotation.