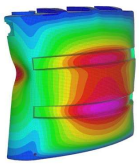


David Beneke Consulting

Finite Element Analysis for Engineering

SELECTIVE PALLET RACKING FOOTPLATE DUCTILITY ANALYSIS
Non-Linear Geometry, Material and Contact Analysis

Date: November 2010

Client: Dematic

Project Description:

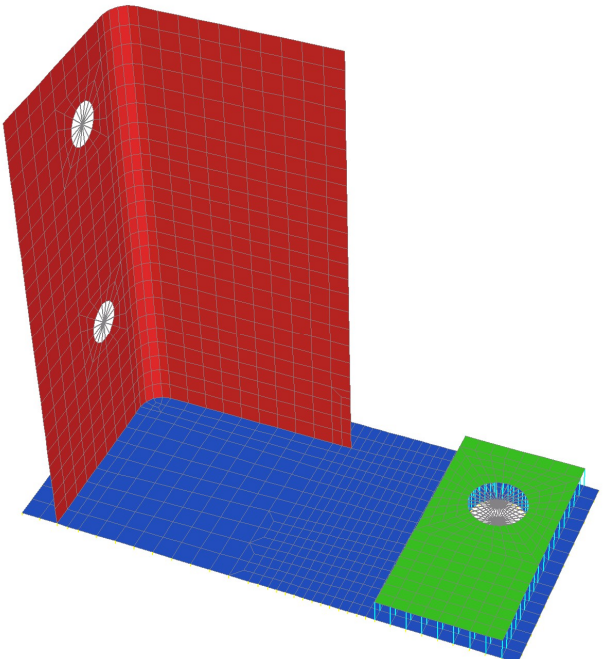
As a part of assisting Dematic in their design of selective pallet racking for earthquake loading, David Beneke Consulting was commissioned to investigate the vertical load versus displacement characteristics of one their upright footplates. This data could then be used to derive the ductility of this connection in an attempt to reduce levels of earthquake loads.

The finite element analysis (FEA) model of the footplate consisted of a series of plate/shell elements which represented the horizontal baseplate, the vertical folded U plate section as well as the anchor connection washer. Given that the footplate was singly symmetric about a vertical plane, only half of the footplate was modelled in order to reduce processing time.

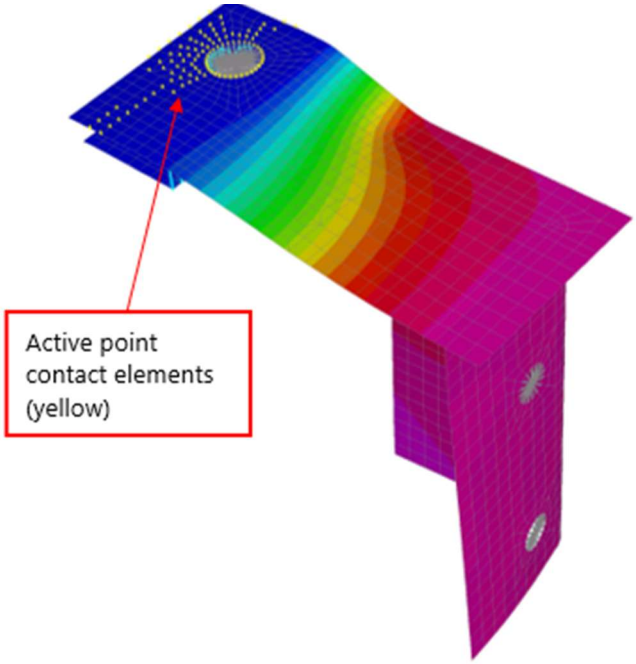
At the contact interface between the underside of the horizontal baseplate and the concrete floor under, a series of compression only point contact elements were used to simulate this interface.

In order to capture the elastic and plastic deformation of the footplate under the vertical load, non-linear material properties were adopted for the horizontal baseplate as well as the vertical folded U plate. A tri-linear stress strain curve was adopted consistent with published test data associated with the chosen material type.

Based on a non-linear analysis, the results indicated enhanced levels of ductility which in turn resulted in lower earthquake forces applied to the pallet racking.



FEA model of the footplate assembly.



Displaced Shape of the footplate assembly under vertical loads with active point contact elements shown in yellow.

Contact:
dbconsulting@live.com.au
Ph +614 1257 5693
23 Narabang Way, Belrose NSW 2085