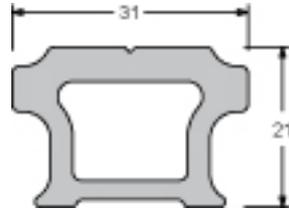


# Load sharing by track fasteners



Some simulation results for Antal 110-track and M8 fasteners.

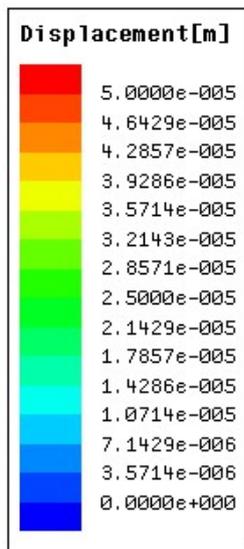
2x5000 N distributed over 140 mm of track length by the main sheet car.

Martin Schöön 2012-03-15

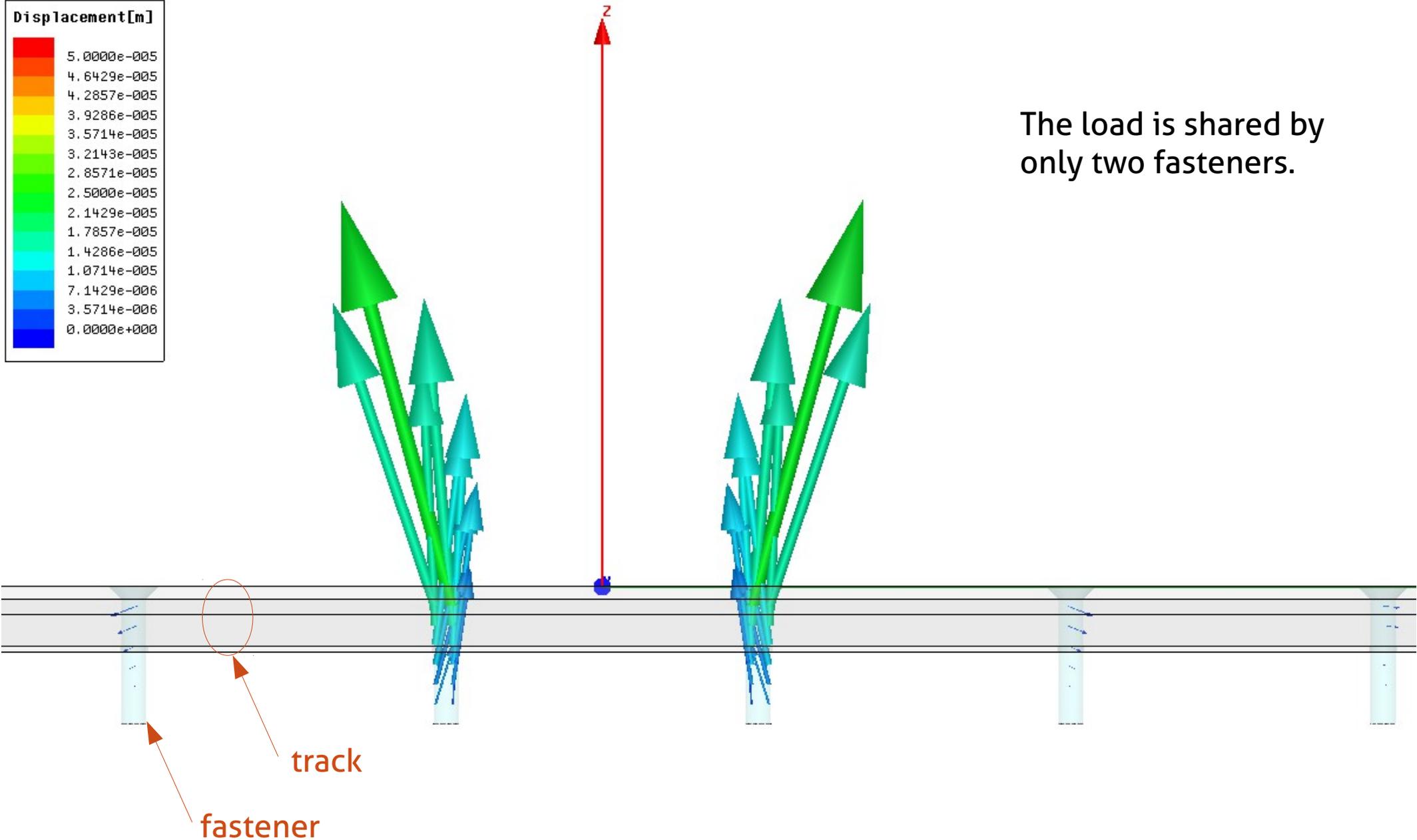
# Model 1

- Aluminum track with simplified cross section.
- M8x40 A4 (~SAE 316L) fasteners, 100mm C-C.
- Fixed boundary condition on bottom surface of fasteners.
- The main sheet car load is purely vertical and 10kN (weight of ~1 tonne). This load is spread over two 140mm long and 5mm wide surfaces at the location of the car: 7MPa surface pressure. (I am assuming the car is infinitely stiff compared to the track.)

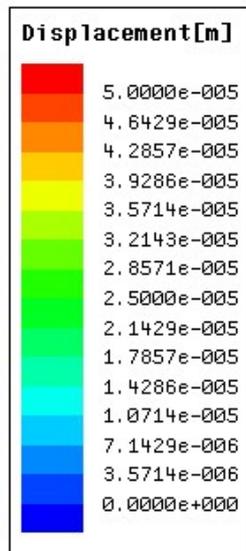
# Car centred between two fasteners



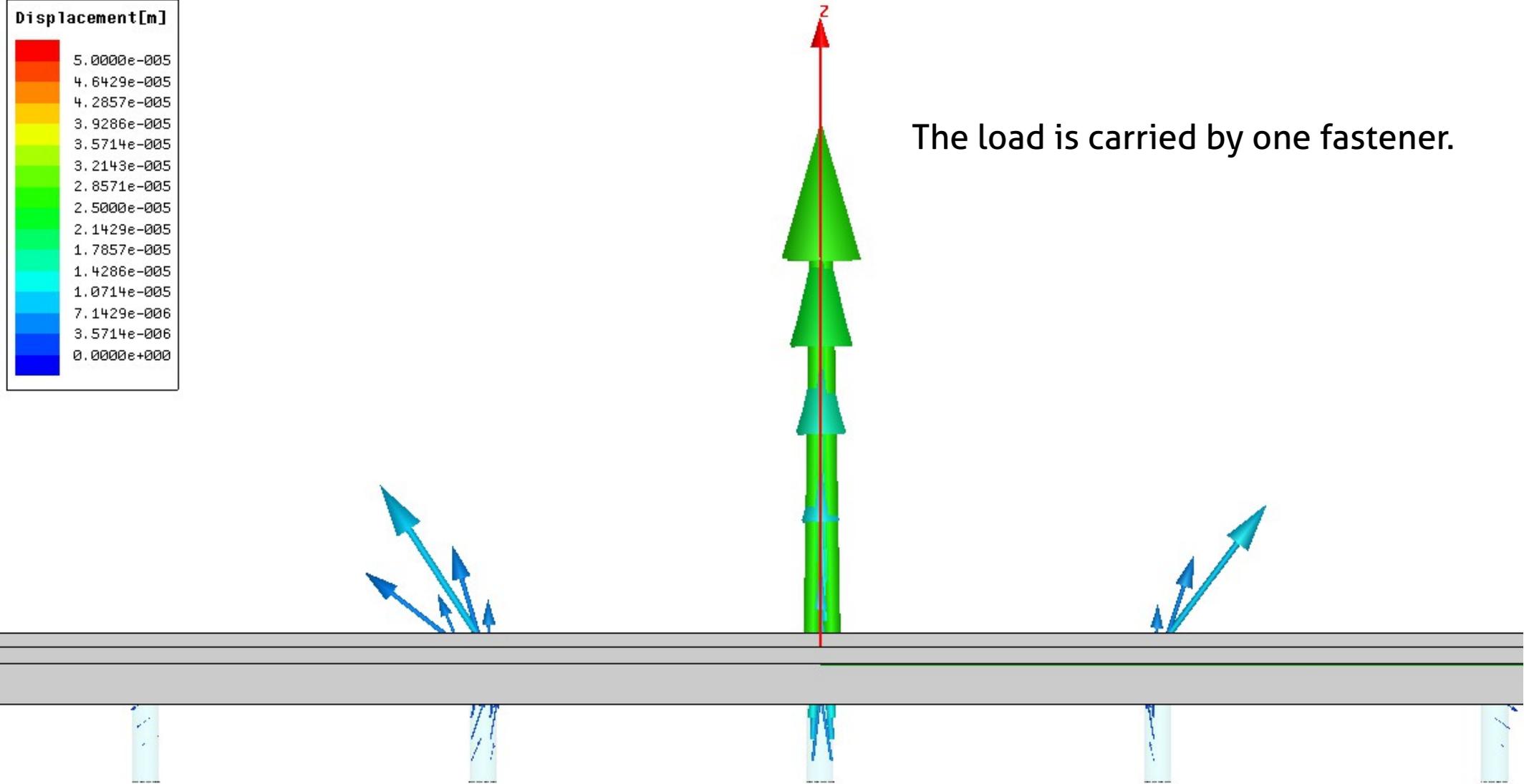
The load is shared by only two fasteners.



# Car centred on one fastener



The load is carried by one fastener.



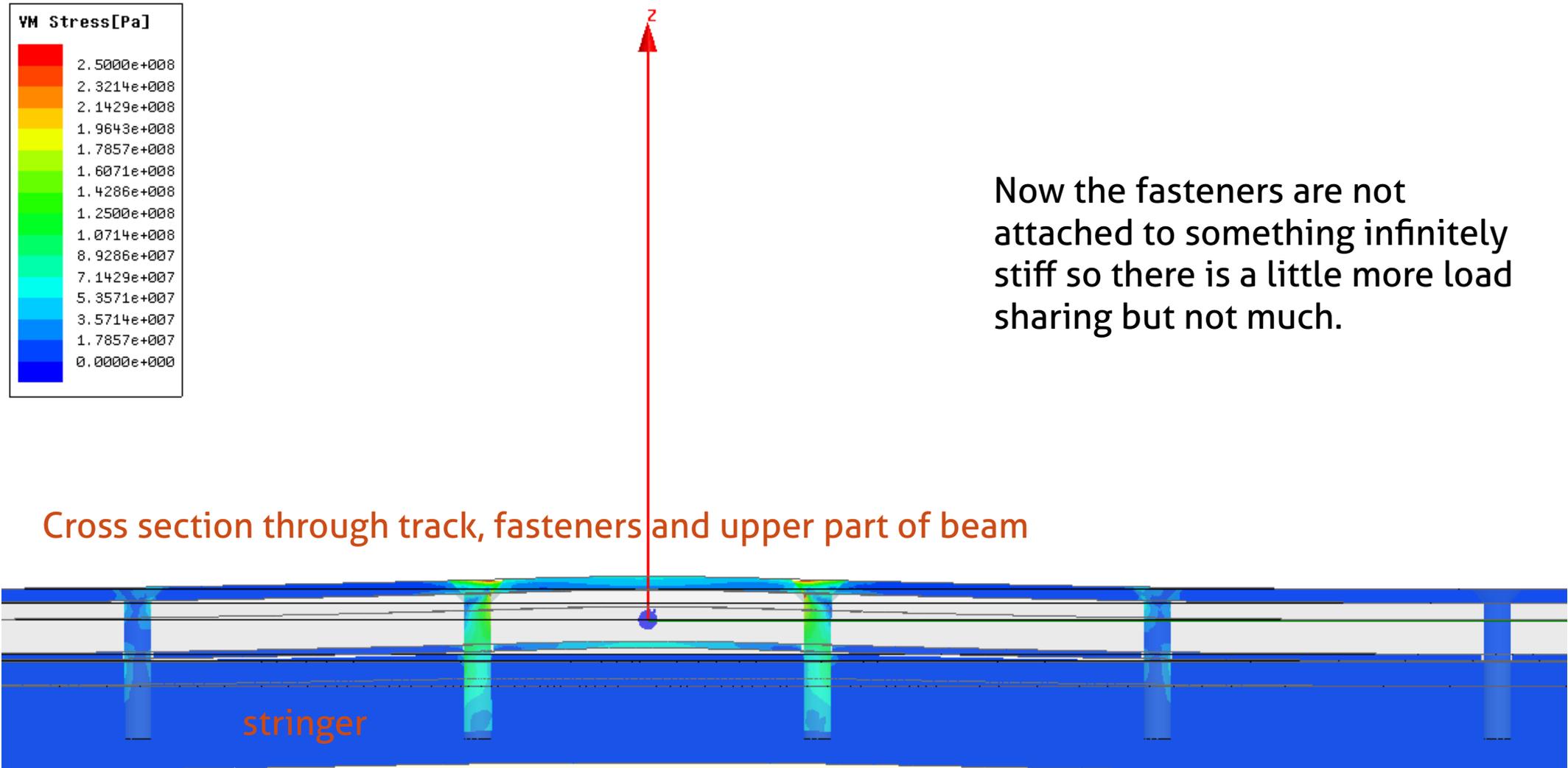
# Model 2

- Same track and fasteners as in Model 1.
- Same load cases as in Model 1.
- Track attached to wooden aft beam using fasteners.
- The contribution from the local deformation of the beam is what matters. The over-all bending of the beam is not coming into play. Hence, the model is local and does not include the total length of the beam.

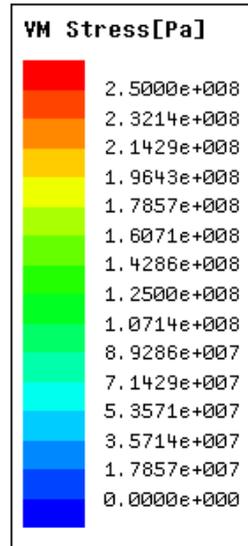
# Car between two fasteners

Now the fasteners are not attached to something infinitely stiff so there is a little more load sharing but not much.

Cross section through track, fasteners and upper part of beam

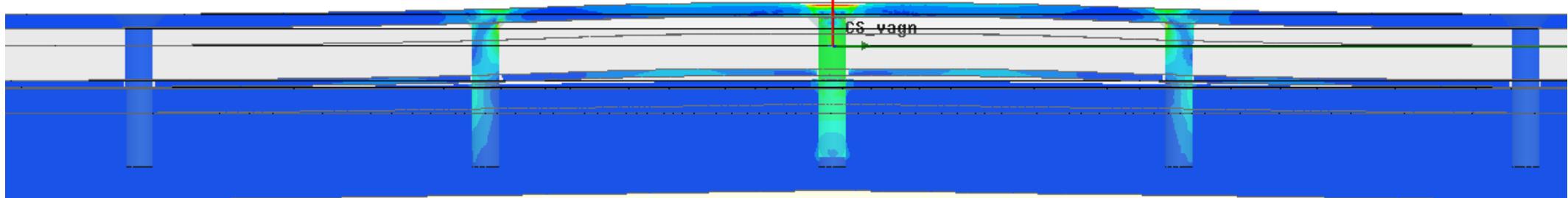


# Car centred on one fastener.



z

Better load sharing but the middle fastener is still making the biggest contribution.



# My interpretation

- In the first model the steel fastener is much stiffer in tension than the track is in bending so the track does not transfer any load before the nearest fastener(s) has/have stretched enough to take all of the load.
- The rear crossbeam structure of the second model is softer and therefore there is a bit more load sharing.
- A stiffer track and 'softer' fasteners (longer, thinner, differ material) both increase the load sharing but I do not know how much.

# Conclusion

- Make sure each fastener singlehandedly can cope with the full load from the main sheet.