Hydraulic scissor lift table, 1000 kg

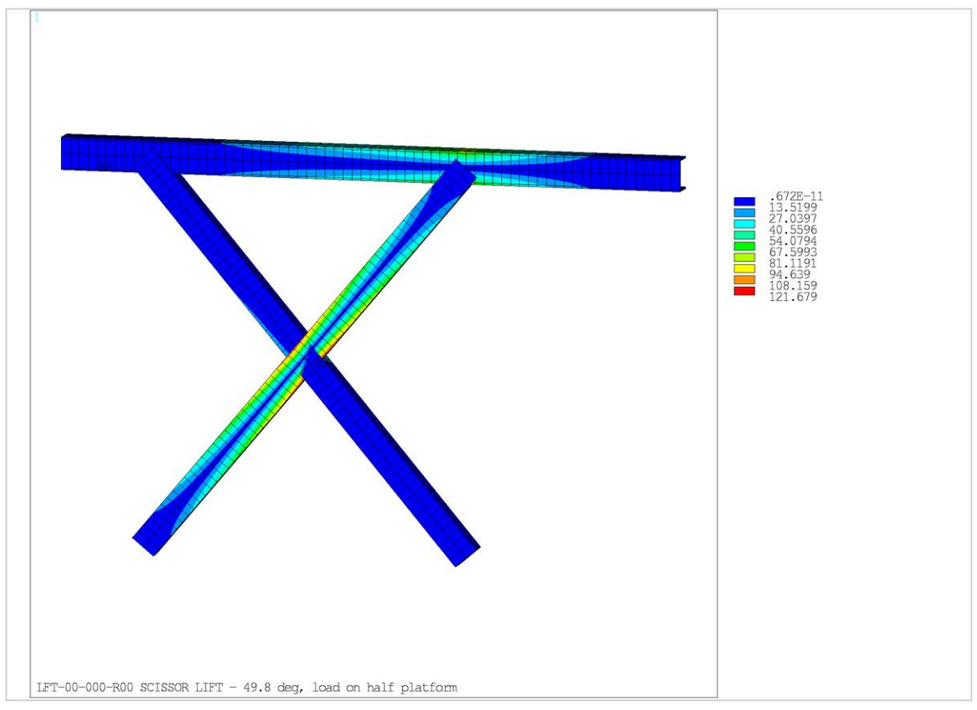
Concept design · parametric 3D CAD · kinematics and statics in MATLAB · beam FEA





Design data

Rated load	1000 kg (x 1.25 in checks)
Platform	1360 x 800 mm, 6 mm chequer
Height	227 to 917 mm
Lift	single scissor, 1 cylinder
Cylinder	bore 80, stroke 352 mm
Max pressure	173 bar (lowered)
Arms	flat bar 60 x 40, S355
Pins	D30, C45
Rollers	D60, retained in C 70 x 50
Mass	208 kg, 0 interferences



Results, one scissor side (load x 1.25)

	FEA	Hand (MATLAB)
Cylinder force, lowered	43.4 kN	43.4 kN
Cylinder force, raised	8.79 kN	8.79 kN
Arm stress, worst case	131 MPa gross (151 MPa net)	153 MPa net allow. 231 MPa
Pin shear		61 MPa / 173
Platform deflection	5.9 mm max	

Method

Closed-form statics of the scissor from 8 to 50 degrees in MATLAB, with the load centred and on half platform, to size the cylinder, pins and arms. The worst positions are then checked with a planar beam model: pinned joints, rollers free to slide, cylinder as a link. Cylinder forces match the hand model exactly. Worst case: platform lowered, load on half platform.