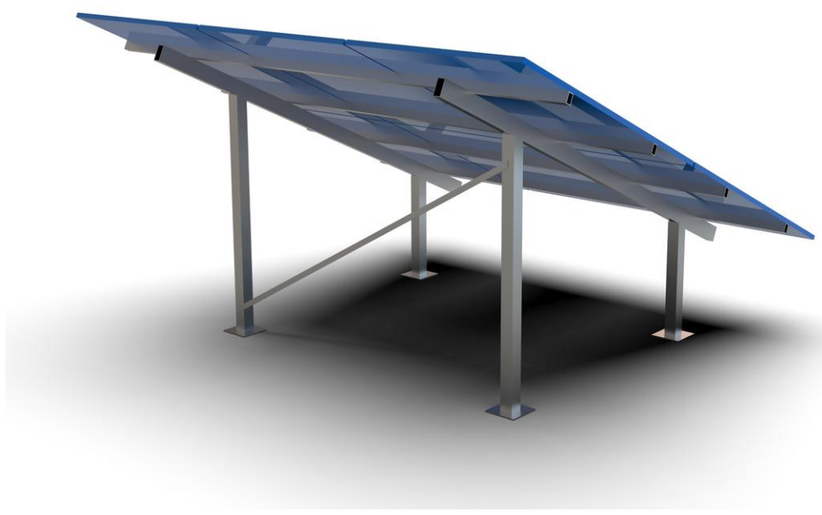
Ground-mount structure for 6 PV modules, 25 deg tilt

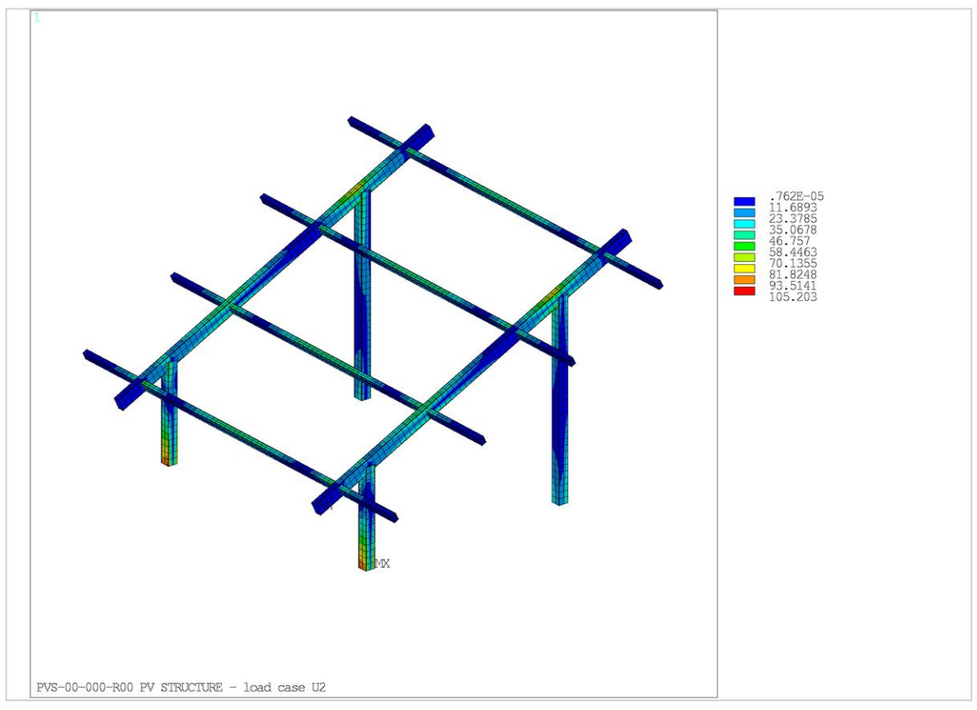
Concept design · parametric 3D CAD · loads and hand checks in MATLAB · 3D beam FEA





Design data

Modules	6 x 1722 x 1134 mm, 22 kg
Tilt	fixed, 25 deg
Table	3.46 x 3.44 m
Posts	RHS 80 x 80 x 3
Rafters	RHS 100 x 50 x 3
Purlins	RHS 60 x 40 x 3
Steel	S355, hot-dip galvanised
Structure mass	153 kg, 0 interferences
Assumed loads	snow 0.80, wind +1.00 / -1.30 kN/m2



Results (design combinations)

	FEA	Hand (MATLAB)
Vertical / horizontal load, snow + wind	26.3 / 4.5 kN	26.3 / 4.5 kN
Purlin stress, snow + wind	93 MPa	109 MPa
Post stress, wind uplift	105 MPa	
Highest utilisation (fy 355)	0.30	
Uplift at rear foot	6.7 kN	ballast 764 kg
Purlin deflection, service	3.0 mm	

Method

Loads per purlin from assumed design values of snow and wind, combined as 1.35 G + 1.5 snow + 0.9 wind and 1.0 G + 1.5 wind uplift. A 3D beam model (505 elements, posts fixed at the base) gives stresses, deflections and foot reactions for each combination; the hand model checks global equilibrium, which matches exactly, and the purlin in biaxial bending, which is 17 % on the safe side.