Structural Analysis of a Lifting bracket

Dara Switchboards

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Introduction

Weight carrying capacity of lifting angle (Figure 1) was investigated using the finite element analysis.
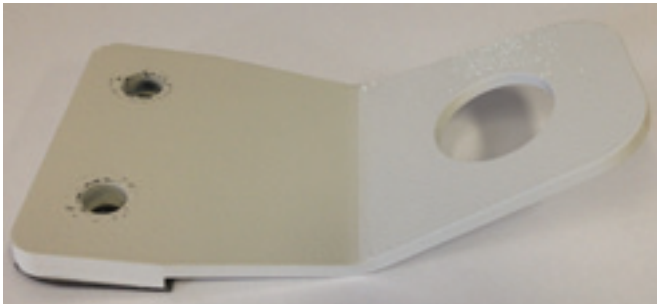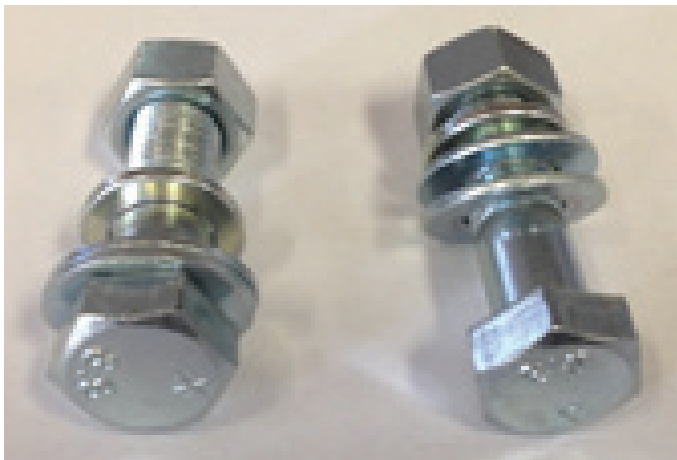

Figure 1: Lifting angle

Figure 2: High strength steel bolts used with the lifting angle

Material properties

Material properties of bolts were extracted from the manufactures as shown in Table 1.
Table 1: Material properties

Part	Material	UTS (MPa)
Lifting angle	Mild steel	350
Bolts	HSS	827

Finite element analysis

Static structural analysis was carried out using commercially available finite element analysis software.

Meshing

2 mm tetrahedron mesh was used for both lifting angle and bolts.
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Boundary conditions

4000N pulling force was applied to each bolt to represent the weight of the switchboard. A fixed boundary condition was applied to the eye of the lifting angle.
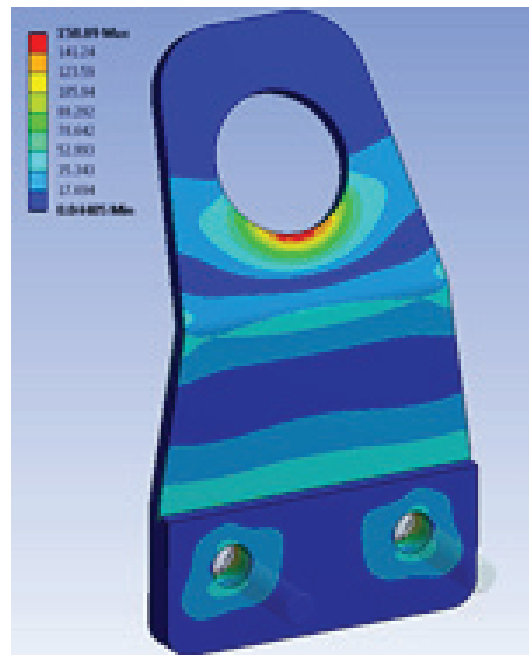.

Figure 3: Maximum stress of lifting angle

Results

The maximum displacement of lifting angle under 800 kg load was 0.28 mm. Maximum von-Mises stresses generated on lifting angle and bolts were 150.89 MPa and 420.24 MPa respectively. Therefore, a minimum safety factor of 2.2 and 2.0 was shown in the lifting angle and bolts respectively for 800 kg load.

Conclusion

The lifting angle assembly can carry a maximum load of 800 kg with a minimum safety factor of 2. Hence, switchboards with 2 and 4 lifting angles can have maximum weight of 1600 kg and 3200 kg respectively.
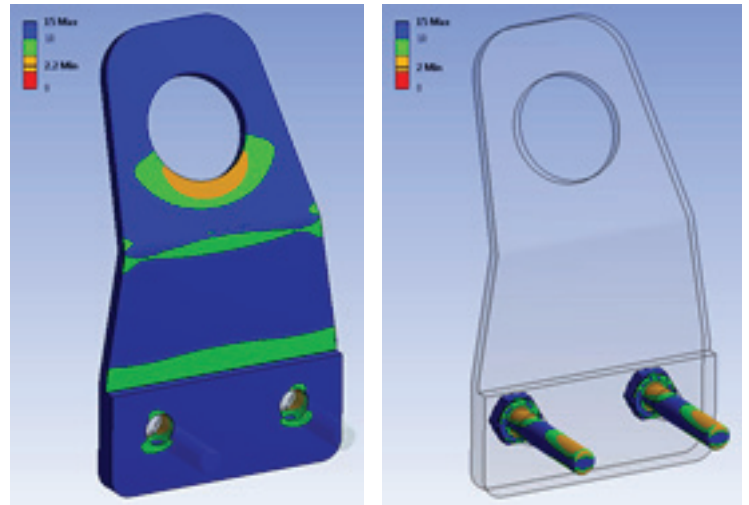

Figure 4: Minimum safety factors of lifting angle and bolts

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