6 CONCLUSION

The simulations done to verify uniaxial fatigue and multi-axial fatigue gave successful results which are closer to experimental results. This shows the fatigue simulation technique used is acceptable.

Moreover uni-axial fatigue sensitivity analysis indicated that surface finish is a highly sensitive parameter. The surface finish of a same material is varying depending on the machining or moulding method. Hence the surface finish of the exact material to be used in the site should be measured before simulations. Comparison of the results of the dataset importing methods indicated that elastic block method gives poor results. Although elastic plastic dataset importing method requires finite element simulations for each and every strain amplitude, it gives closer results to the experiment results. The endurance of multi-axial fatigue simulation is closer to the average of the experimental endurance values. Hence the techniques used can be expected to give acceptable results for both uni axial and multi axial fatigue.

The case study done on the steel mast shows highest stress concentrations around the opening. It was found that for same opening area, rectangular shape induce less stress than circular shape. This shows that the effect of larger horizontal opening dimension at the centre level in circular opening is more significant than the stress concentration induced at the corners of square opening. Hence a rectangular opening shape with least possible dimension in the horizontal direction would give the highest endurance. The plate thickness comparison showed that even a small increase in the plate thickness rapidly increases the endurance of the mast. This indicates the importance of using stiffeners in the areas prone to fatigue damage. The highest stresses in this mast are seen near the edges of the opening hence stiffeners with higher plate thickness along the edge of the opening is recommended. Altogether rectangular shape with least possible dimension in horizontal direction with stiffeners along the edges will enhance the fatigue life of the mast. Smoothening the corners of the opening will also enhance the fatigue life. However it should be noted that only monolithic sections are considered in this study and the effects of welds and bolted connections were ignored.