

Fatigue life Evaluation in Corner Welded Joints

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Abstract. The fatigue life of welded metal joints is often found to be lower than that of components with no weld [1]. This can be due to differing cooling rates within the weld leading to residual stresses [2], changes in the microstructure in the fusion and heat-affected zones and other geometric features of the weld. The fatigue performance of welds may be improved through e.g. heat treatment; however, these methods may not always be effective.

Possible Sessions

8. Fatigue and Fracture, 13. Metals and Microstructure

Introduction

Rectangular hollow steel sections containing high frequency induction welds that were subjected to normalisation heat treatment were provided for testing. This was performed to examine the difference between welded and non-welded areas of the same tube and determine how the fatigue resistance was affected by the weld. They were also supplied in weld bead trimmed and untrimmed forms. In particular, the welded corners may pose a higher risk of failure as these are located at inherent stress concentrations. This is shown in Figure 1 where the edges of the bead show potential initiation regions for fatigue crack growth.

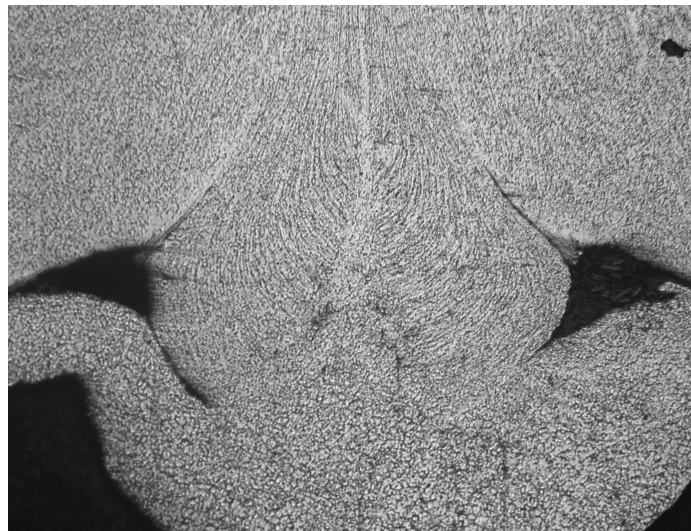


Figure 1: Microscope image showing features on either side of the weld bead.

Conclusions

Welded corners (untrimmed) have shown lower fatigue life compared to non-welded counterparts due to geometric features leading to premature crack initiation. This leads to greater crack growth at lower stresses. Finite element modelling was used to quantify the stress concentration factor of the weld geometry compared to that of the unwelded. Future testing will determine if this effect carries into full scale sections.

References

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