

Study on the effect of welding residual stresses on crack-tip constraint

X. B. Ren ^a, Z. L. Zhang ^{a*} and B. Nyhus ^b

^a *Department of Structure Engineering, Norwegian University of science and Technology (NTNU), N-7491 Trondheim, Norway*

^b *SINTEF Material and Chemistry, N-7465 Trondheim, Norway*

Welding residual stresses are unavoidable and play a crucial role in integrity assessment procedure. Proper treatment of the welding residual stresses in integrity assessment becomes increasingly important when high strength steels are widely used in the offshore industry. This study focuses on the effect of residual stresses on crack-tip constraint. Modified boundary layer models with remote displacement field controlled by a *K-field* and *T-stress* were used. A two-dimensional residual stress field was introduced into the model by the eigenstrain method. The results show that residual stresses can increase the crack tip constraint. However, the residual stress induced crack tip constraint decreases with the increase of external loading. It has also been found that the effect of residual stresses is coupled with the *T* stress and becomes less significant when the *T* stress is positive.

Key words: Residual stresses; Crack-tip constraint; Failure assessment

* Corresponding author: zhiliang.zhang@ntnu.no