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P-317**Consideration on short crack propagation resistance in SM490 steels with different ΔK_{th}**

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ABSTRACT:

In order to improve fatigue life of steel structures, fatigue crack propagation properties in region I near ΔK_{th} have been studied. However, fatigue crack resistance for long crack propagation does not necessarily improve the fatigue life in a condition of increasing ΔK from a small defect, which is usually detected in practical fatigue damage in actual structures in service. In this study, developed and conventional SM490 steels with different ΔK_{th} were fabricated, and surface crack propagation tests were performed using specimens with artificial small defects to investigate the effect of ΔK_{th} under more practical conditions. The fatigue life of the developed steel was about three times longer than that of the conventional steel. The surface crack propagated below ΔK_{th} only in the developed steels, which suggested the short crack regime. The crack propagation that deviated from long crack behavior was convincingly explained by the corrected threshold using the R-curve model of a short crack proposed in the literature. Based on the experimental fatigue life improvement and its analytical estimation of the propagation resistance in the short crack regime, the effect of the ΔK_{th} value for a long crack in the initial propagation stage just after fatigue crack initiation was discussed.

KEYWORDS:

low carbon steel; fatigue crack propagation; threshold stress intensity factor range; short crack regime

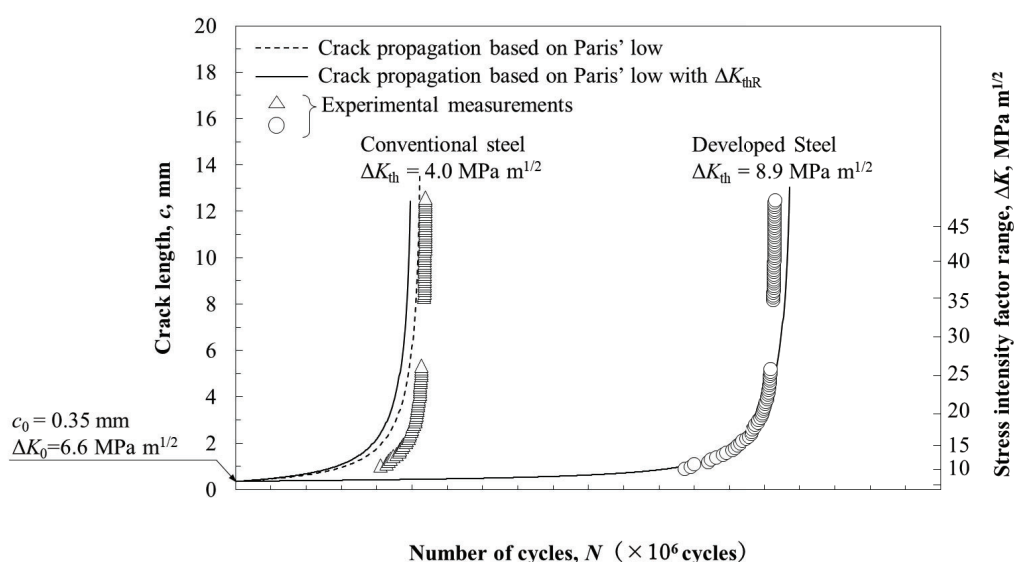


Fig. 1 Experimental c - N relations in surface crack propagation test and crack propagation analysis based on Paris' law with ΔK_{th} and ΔK_{thR} .