*The 2025 World Congress on*
***Advances in Structural Engineering and Mechanics (ASEM25)***
*BEXCO, Busan, Korea, August 11-14, 2025*

# Fatigue Crack Growth Behavior of CT and SENB Specimens

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## ABSTRACT

This study conducts a comparative investigation into the fatigue crack growth behavior of Compact Tension (CT) and Single Edge Notched Bend (SENB) specimens. By setting the CT loading at 1.1 times the SENB loading ($P_{CT}$ = 1.1 $P_{SENB}$), the maximum stress intensity factor ($K_I$) values of the two specimen types were observed to be highly consistent across a broad range of crack lengths (0.2 < a/W < 0.7). However, differences emerged in the evolution of plastic zone size and crack tip opening displacement (CTOD): initially, SENB specimens exhibited larger plastic zones, while at greater crack lengths (a/W > 0.5), CT specimens showed greater plastic deformation and crack tip openings. Fatigue crack growth experiments further demonstrated that despite similar final crack propagation lives (within 5% difference), the crack growth paths varied significantly. These findings indicate that while $K_I$ equivalence aligns the critical stress conditions, additional factors such as local plastic zone evolution must be considered to fully capture the fatigue crack growth behavior under different specimen configurations. This study highlights the importance of adopting comprehensive crack tip parameters beyond K-dominance in fatigue analyses and provides practical guidelines for experimental design when comparing CT and SENB specimens.

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