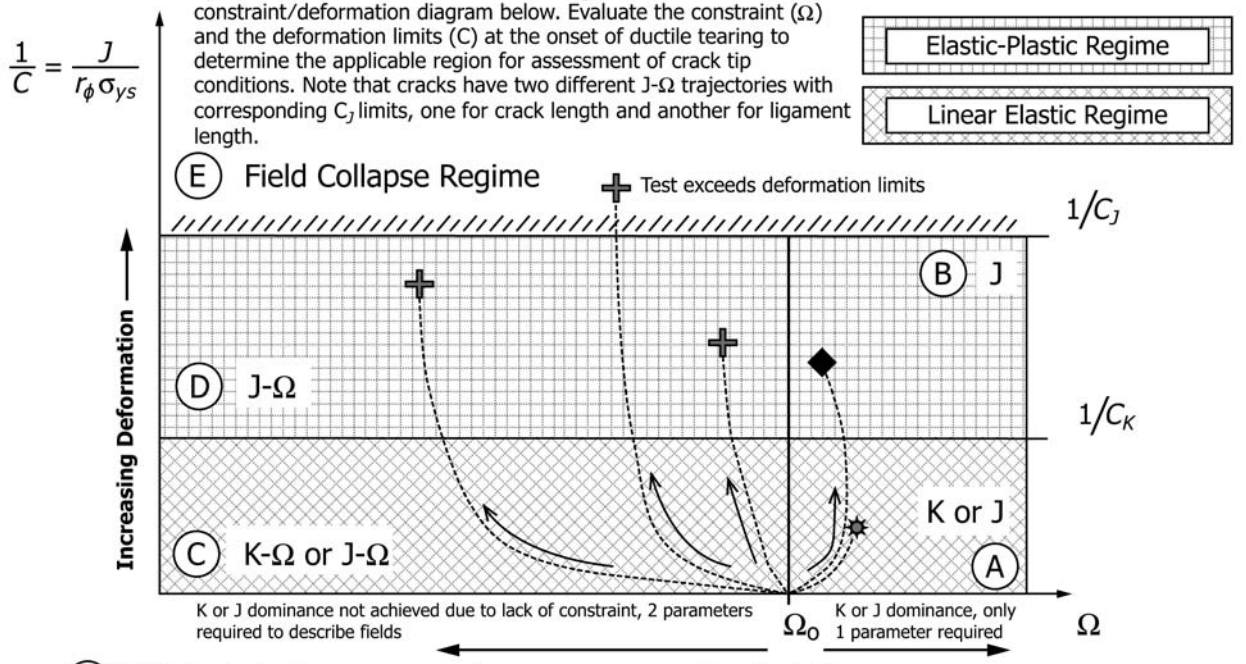
$$\frac{1}{C} = \frac{J}{r_\phi \sigma_{ys}}$$

At initiation of ductile tearing in a test sample or structure, the crack tip conditions will fall into one of the 5 regions A-E in the constraint/deformation diagram below. Evaluate the constraint ($\Omega$) and the deformation limits (C) at the onset of ductile tearing to determine the applicable region for assessment of crack tip conditions. Note that cracks have two different J-$\Omega$ trajectories with corresponding $C_J$ limits, one for crack length and another for ligament length.




(A) LEFM, K or J dominance, 1 parameter

(B) EPFM, J dominance, 1 parameter

(C) LEFM, K or J with constraint, 2 parameters

(D) EPFM, J with constraint, 2 parameters

(E) Constraint Influenced Collapse, Alternative methods

$\Omega$ = Constraint measure

$\Omega_o$ = Constraint condition equivalent to T = Q = 0

------ Loading trajectories

Example: E399 Klc test

Example: E1820 Jlc test

Examples: Surface crack tests