Chapter 8  Failure

Ductile and brittle fracture

Moderately ductile fracture
Brittle fracture surfaces

Brittle fracture
Stress concentration factor

Fracture modes
Chapter 8  Failure

Temperature effect on impact energy

Cyclic loading
Cyclic stress

Flexural loading

Torsional loading

Fatigue Design Parameters

\[ S = \text{stress amplitude} \]

\[ S_{\text{fat}} \]

\[ 10^3 \quad 10^5 \quad 10^7 \quad 10^9 \]

\[ N = \text{Cycles to failure} \]
Chapter 8  Failure

The S-N curve

Fatigue Mechanism

crack origin
Creep - temperature dependence

Secondary Creep

Steady state creep rate $\dot{\varepsilon}_S$ (%/1000hr) versus stress (MPa)

- $427^\circ C$
- $538^\circ C$
- $649^\circ C$
Chapter 8  Failure

Prediction of Creep Rupture Lifetime

![Graph showing stress vs. lifetime for S-590 Iron](image)