

Section C1 - The Mechanical Properties of Materials

- C1.1 describe the elements of a tensile test and relate experimental parameters and measured quantities to stress, strain, modulus, ductility, and toughness.
- C1.2 draw a typical stress-strain diagram characteristic of the different classes of engineering materials
- C1.3 distinguish between elastic and plastic deformation
- C1.4 describe the role of dislocations in plastic deformation of crystalline materials
- C1.5 name and describe the principal methods of strengthening of a metal: strain hardening (i.e. work hardening), solution strengthening, precipitation strengthening, and grain refining.
- C1.6 describe several different methods for measuring hardness and relate hardness to yield strength
- C1.7 relate changes in a cold-worked microstructure due to annealing to corresponding changes in mechanical properties.
- C1.8 distinguish between the resistance to deformation and to fracture and name their units.
- C1.9 define a stress concentrator
- C1.10 define fracture toughness and relate it to yield strength and flaw size
- C1.11 differentiate between the different classes of engineering materials in terms of their fracture toughness
- C1.12 define the term safety factor and describe its role in materials selection and design
- C1.13 define fatigue and cite engineering examples where it often occurs
- C1.14 define creep and name important engineering situations where it plays a major role.